VOLUME IV, NUMBER 1 JULY 1945

THE BULLETIN

OF THE

U. S. Army Medical Department

ISSUED MONTHLY

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
WASHINGTON 25, D. C.

THE BULLETIN

OF THE

U. S. Army Medical Department

Subscriptions may be placed with the Book Department, Medical Field Service School, Carlisle Barracks, Pennsylvania.

Annual subscription: $2.00; foreign subscription: $2.50.
Single copies, domestic, 25 cents; foreign, 30 cents.

All other communications relating to this publication should be addressed to The Surgeon General, U. S. Army, Washington 25, D. C.

Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

Contents

NEWS AND COMMENT

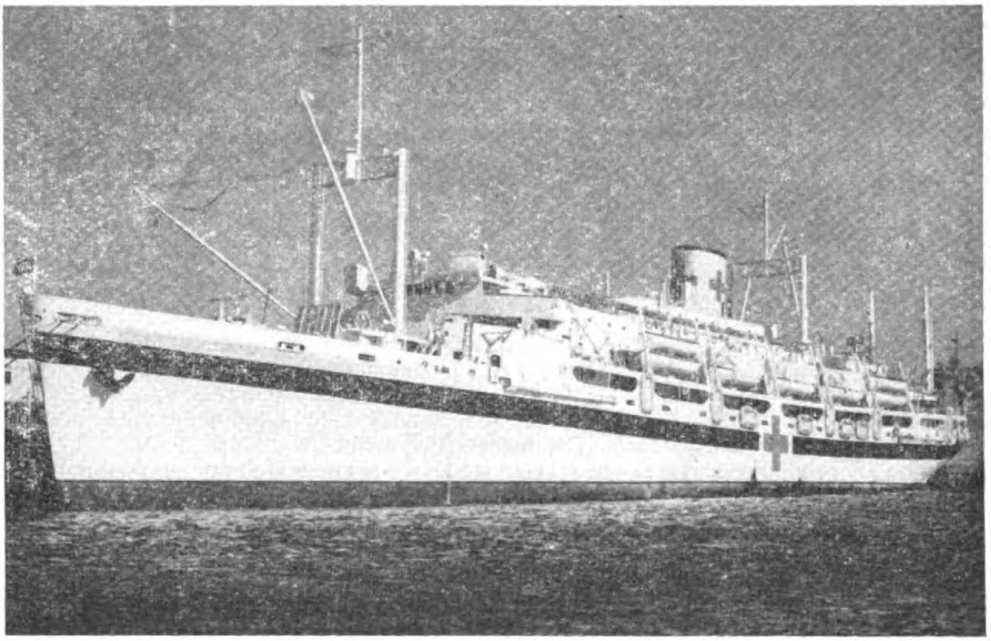
CORRESPONDENCE

ORIGINAL ARTICLES

SPECIAL ARTICLES

APPARATUS AND CLINICAL NOTES

THE U. S. HOSPITAL SHIP "COMFORT"



In the evening of 28 April 1945, the U. S. Hospital Ship *Comfort* was evacuating casualties, recently from the battlefields, from Okinawa to the base at Guam. The ship was some 70 miles off Okinawa and was brightly lighted and easily identified. On board were 517 casualties, the Army hospital personnel of the 205th Hospital Ship Complement, and the Navy crew. The surgical unit was very busy caring for the casualties, and six patients were undergoing anesthesia at the time. Suddenly a Jap plane appeared out of a low sky and plunged into the hospital ship, passing through two decks of operating rooms and finally coming to a halt in a linen closet. The explosion that followed killed six doctors, six nurses, and nine hospital corpsmen outright and wounded many others, one of whom, the chaplain, has since died. Extensive damage was done to the ship, which is at present undergoing repairs. These will also include completely new surgical, x-ray, and dental equipment. Following are the names of those whose lives were lost in this disaster:

Major Edwin B. Eckerson, M.C.
Captain Ernest Foss, Jr., M.C.
Captain William A. MacPherson, M.C.
Captain Charles D. Clark, M.C.
First Lieut. John F. O'Brien, Jr., M.C.
Lieut. Commander Wallace L. Chesbro, M.C.
Lieut. Fidelia M. Weiland, Navy chaplain
Private First Class Clovis E. Smith
Private First Class Duane M. Walters
Technician Fifth Grade Robert O. Isenburg
Private First Class Clayton R. Woodworth
Private First Class Samuel D. Sutker
Technician Fifth Grade John R. Krauss
Technician Fourth Grade Howard H. Salisbury
Private First Class Cecil H. Dammerman
Private First Class Harry J. Drewa

Nurses

First Lieut. Florence T. Grewer
Second Lieut. Dorothy M. Stanke
Second Lieut. Ida M. Greenwood
Second Lieut. Frances O. Chesley
Second Lieut. Margaret M. Billings
Second Lieut. Evelyn C. Eckert

News and Comment

A STUDY OF SHOCK IN BATTLE CASUALTIES

Early in the war the hope was entertained that the transfusion of plasma alone would prove effective therapy for the majority of patients suffering from traumatic shock. However, limitations in the effectiveness of the plasma as a sole replacement medium have since become apparent. Many surgeons operating at the front in the African and Sicilian campaigns observed that a considerable proportion of cases in severe shock failed to respond adequately to plasma transfusions. This type of case appeared to respond more favorably to the transfusion of whole blood in addition to plasma. Throughout the Normandy Campaign large amounts of refrigerated whole blood were supplied to the field and evacuation hospitals. A survey of field hospitals at the time of the intense fighting in the vicinity of St. Lo indicated that the total allowance of whole blood and plasma given to nontransportable casualties through the first postoperative day averaged 1,250 cc. of whole blood and 750 cc. of plasma per patient. These cases had received an average of 550 cc. of plasma in the battalion aid station or clearing station prior to admission to hospital; the final ratio of whole blood to plasma given, therefore, averaged 1:1. The unexpectedly high proportion of whole blood required raised the question as to whether its preference by the field surgeons was dictated on the basis of sound indication or, possibly, on false impressions.

The authors, therefore, made a preliminary study on 55 nontransportable patients treated in field hospitals, making serial determinations of the hemoglobin concentration and arterial pressures, with relation to the clinical condition and course in response to therapy. The data obtained indicated that the magnitude of the blood loss sustained by patients with signs of severe shock was substantially greater than had been generally appreciated. A striking anemia was present at the conclusion of therapy, despite massive whole blood transfusions, and it was obvious that whole blood was not being used to excess; indeed, the data suggested that possibly even more should be administered for optimum therapeutic results than was the customary practice.

A second investigation, planned to accumulate more precise data on the pathologic physiology of traumatic shock, with special reference to the therapeutic problems involved, was carried out on severely wounded casualties in a field hospital during the campaign on the German border in September

Abstract of paper by Major C. P. Emerson, Jr., M. C., A. U. S., and Major R. V. Ebert, M. C., A. U. S., submitted through The Surgeon General's Office to the Annals of Surgery.

1944. The summary and conclusions of the author's paper follow:

One hundred and twelve battle casualties admitted to a field hospital with serious abdominal, chest, or extremity wounds have been studied. Fifty percent of these patients were in severe shock. Detailed clinical observations were made in all cases, and serial determinations of either the hemoglobin concentration or hematocrit reading were performed. Measurements of the plasma volume and plasma-protein concentration, as well as hematocrit reading, were completed in 57 cases; in 33 cases multiple blood volume determinations were made, either in the course of transfusion therapy, or before and after operation.

The arterial blood pressure was found to provide the most reliable clinical index of blood volume deficiency. All patients with initial systolic pressures below 85 mm. of mercury, excluding cases with spinal cord transection, were found to have marked oligemia, the deficit averaging 40 percent of the expected normal blood volume; all cases with this degree of hypotension had a diminution in blood volume that exceeded 25 percent.

When brought in, this patient was suffering from shock and loss of blood. He was given blood plasma and following this was strong enough to be transferred to a clearing station and then to a hospital. North Africa. Signal Corps photograph.

Blood volume and plasma protein measurements indicated that some degree of spontaneous hemodilution with low protein fluid often occurred in cases suffering from oligemic shock; the amount of this dilution, however, was small, rarely exceeding 200 cc. It is concluded that a normal hematocrit reading, or the demonstration of a mild anemia with a few hours after injury, is no indication that a severe blood loss has not occurred. Severe

anemia was produced by the administration of plasma to patients with marked oligemia.

The majority of patients presented no evidence of an excessive loss of plasma in proportion to red cells; in a few cases with severe abdominal wounds there was demonstrated a disproportionate plasma loss, which resulted in a mild degree of erythroconcentration. The average total blood loss estimated to have occurred in cases of severe shock before admission to the hospital was 63 percent. Hemorrhage appeared to have been most severe in patients with extremity wounds, and least severe in patients with uncomplicated chest wounds.

Blood volume measurements were performed pre- and postoperatively in 10 cases in order to ascertain the degree of blood loss occurring in the course of various surgical procedures. The average loss in 3 cases subjected to open thoracotomy was 600 cc.; 5 patients requiring extensive abdominal surgery lost an average of 2,200 cc. of blood.

Blood flown from United States and Great Britain being loaded on refrigerator truck in Belgium for front-line stations. 9 November 1944. Signal Corps photograph.

Serial determinations of the blood volume indicated that hemorrhage occurred during the course of transfusion therapy in 11 out of 23 patients studied. This complication was encountered most commonly in patients with severe extremity wounds, a majority of these cases suffering a loss which averaged 40 percent of the blood and plasma transfused.

Plasma protein measurements before and after the injection of blood diluted with equal volume of preservative solution indicate that retention of the latter in the blood stream

is transient and of insufficient degree to produce significant hemodilution.

The mortality incidence in all cases admitted in severe shock was 32 percent; of those whose arterial pressure on admission exceeded 85 mm. of mercury, 11 percent died within a similar period, which included the first postoperative day. The majority of deaths were attributable to penetrating abdominal wounds.

Cases are described in which the clinical signs of shock were unrelieved by therapy, despite complete restoration of the blood volume to normal. The factors operative in the production of "irreversible shock" included severe infection, lesions involving the central nervous system, anoxic anoxia due to pulmonary damage, and a long persisting combination of anemia, oligemia, and hypotension, with terminal signs of myocardial insufficiency.

The authors cite the therapeutic indications for the use of whole blood and plasma and discuss the criteria for evaluating the requisite amount of transfusion therapy.

SELECTION OF CASES FOR ARTHROTOMY OF THE KNEE

A follow-up study was made of cases operated on for internal derangement of the knee joint and returned to duty from a general hospital in the Southwest Pacific Area over a two-year period. The necessary information for the study was obtained on 121 cases. Of the 88 cases in which the meniscus was injured, 77 were of the medial meniscus; of these 77 cases, the "bucket-handle" type tear was found in 70 percent; in 25 percent there were multiple tears, and in 5 percent, transverse splits. There were 11 cases (12 percent) in which the lateral meniscus was injured; 7 of these were associated with cystic degeneration of the lateral semilunar cartilage. The posterior third of the semilunar cartilage was injured in 12 of the above cases—11 of the medical meniscus and one of the lateral meniscus. Herniation of the joint capsule in the popliteal region was associated with internal semilunar cartilage injury in 2 patients.

Other findings in the 121 cases were: (1) Osteochondritis dissecans of the femoral condyles in 15 patients and in 12 of these cartilaginous or ossified bodies were present. The lesion was on the medial femoral condyle in 11 cases, usually the lateral aspect, and on the lateral femoral condyle in 4 cases. (2) Chondromalacia of the patella was present in 11 patients. In 9 of these there was no associated meniscus injury. (3) Giant cell tumor of the knee joint capsule was found in 2 cases. (4) Calcification of the split posterior third of the medial

Abstract of paper by Colonel Edwin F. Cave, M.C., A.U.S., Major Carter R. Rowe, M.C., A.U.S., and Captain Lester B. K. Yee, M.C., A.U.S., submitted through The Surgeon General's Office to the Journal of the American Medical Association.

meniscus was present in one case, and ossification in another. (5) Intra-articular ganglia of the patella and quadriceps tendons were present in one patient. (6) An anatomical variation, consisting in a congenital veil or membranous septum dividing the knee completely in the anteroposterior plane, was present in one case.

Six of the 121 cases had been previously operated on in other hospitals. All of these were re-explored and, in all, the authors found tears or partial detachment of an incompletely removed posterior portion of the mesial meniscus. After operation all of these patients were returned to duty. In 5 of the 121 arthrotomies the findings were within normal limits. Two of these presented so-called "hypermobile menisci"; they were removed but the authors did not feel certain that this condition was the basis for the internal derangement. All were sent to duty, four to full military duty and one to limited service duty, where they remained. It is significant that in only one of this latter group was there a history of "locking" of the knee.

The postoperative complications in the 121 cases included one case of postoperative sepsis which developed during a period when many septic battle casualties were arriving, 4 cases of temporary sciatic nerve palsy, and one case of thrombophlebitis.

The authors' experience with elective surgery of the knee joint concurs with the opinions expressed in the May 1944 *Bulletin*, page 100. Their conclusions from their study follow: To prognosticate which patients with internal derangement of the knee will return to full duty after operation, careful preoperative evaluation of the patient as a whole is essential. This involves the sizing up of the individual from the psychological standpoint; the taking of a detailed history as to the mechanism of injury; a systematic and thorough physical examination including: inspection, palpation, motions, stability, stance, and examination of the joints above and below the knee. The opposite or normal knee should always be examined for comparison. Usually the patients can be classified into two groups: (1) those having uncomplicated meniscus injuries, and (2) those with damage to the articular surfaces or ligaments, which may or may not be associated with meniscus injury. The vast majority of patients with an uncomplicated meniscus injury can be returned to and will remain at full military duty if a careful operation is carried out and if the patient is reconditioned prior to his discharge from the hospital.

Patients whose knee disability is due to, or complicated by, articular damage or instability of the joint should not be operated on in an overseas theater, unless symptoms are sufficient to cause severe pain or locking of the joint. Exceptions may be made in so-called "key personnel" who, after operation, can return to limited service duty not requiring excessive use of the knee.

ANNIVERSARY OF THE ARMY MEDICAL DEPARTMENT

The U. S. Army Medical Department will celebrate its 170th anniversary on 27 July of this year with the realization that it has grown into the largest organization of the kind ever known and that it is giving this nation's Army the best medical care that any soldiers have ever received.

From its inception in 1775 shortly after George Washington became Commander-in-Chief of the Continental Army until the present day, the Army Medical Department has made steady progress in military medicine; it has made scientific discoveries that have benefited all of mankind; but never has its progress in both of these categories been so rapid as in recent years.

The Honorable Robert P. Patterson, Under Secretary of War, in a tribute to the work being done by the Medical Department, recently said that no Army at any time in history has achieved a record of recovery from wounds and freedom from disease comparable to that of the American Army in this war. Mr. Patterson said that the Medical Department is attaining new records in almost every field of its endeavor. He cited Army's record of saving nearly ninety-seven of every one hundred wounded soldiers who reach Army hospitals, the disease rate of less than one in, one thousand, and similarly startling figures with reference to malaria, the dysenteries, and other diseases, showing that the Medical Department has established effective control on all disease fronts.

Major General Norman T. Kirk, The Surgeon General, is highly appreciative of the part taken by each and every member of the Medical Department in achieving this record. He suggests that, along with those in Washington who are planning to celebrate the birthday of the Medical Department, commanding officers of all medical units and installations, when feasible, might encourage similar celebrations.

EXCESSIVE USE OF PITRESSIN

It has become increasingly difficult for manufacturers to obtain enough pituitary glands to meet the Army's demands for certain biologic products derived from them. The Medical Department is, for this reason, in short supply of pitressin and is now forced to substitute one ampule of pituitary solution (Med. Dept. Item No. 1353000) for one ampule of pitressin (Med. Dept. Item No. 1352505) and two ampules of pituitary solution (Item No. 1353000) for one ampule of pitressin (Item No. 1352510).

It is extremely difficult to understand how the Army Medical Department can possibly use the large amounts of pitressin which have been requisitioned and issued during 1944. In years past, when, as a result of excessive or rough handling of abdominal viscera, postoperative distension was not an uncommon complication of abdominal surgery, this drug was introduced and employed by some to stimulate expulsion of gas from the large bowel. In the best surgical clinics today, how-

ever, this drug is used infrequently, if at all. Minimal and gentle handling of abdominal structures has become recognized as the most important factor in preventing postoperative adynamic ileus. The occasional case which develops distension of the large bowel following surgery can usually be relieved by the use of a rectal tube. Pitressin has never been widely used in cases of paralytic ileus complicating peritonitis. Its use in such cases, in fact, is considered by most surgeons undesirable and irrational.

A TOWEL FOR USE IN THIGH AMPUTATIONS

An efficient and inexpensive towel to drape the thigh during amputations has been reported to The Surgeon General by Dr. Richard H. Lawler, attending surgeon to the Cook County Hospital in Chicago, where its value, particularly as a retractor, has been demonstrated on patients at that large hospital where thigh amputations are frequently performed. The material necessary consists of an ordinary 26- by 18-inch towel as used in surgical procedures, and three triple-thickness strips of toweling ½ inch by 24 inches. The towel is cut one-half way through at center with a circle about 1 inch in diameter cut out of the center (figure 1); the edges are folded to form a seam about ½ inch wide. One of the ½- by 24-inch strips is sewed to the toweling around the center opening. The other two strips are sewed to the towel around a circle of about 11 inches in diameter and so placed that finger openings are present between the strips and the towel itself. This completes the towel.

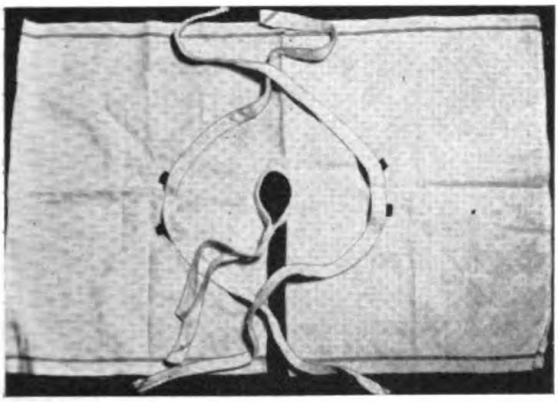


FIGURE 1

After the muscle has been separated by the surgeon and the bone is ready to be sawed through, the towel is applied by placing it around the bone and tying the center ties of the towel so that the knot is on the side of the cut muscle. The towel is then folded over the proximal stump and the other ties are made. This will shape the

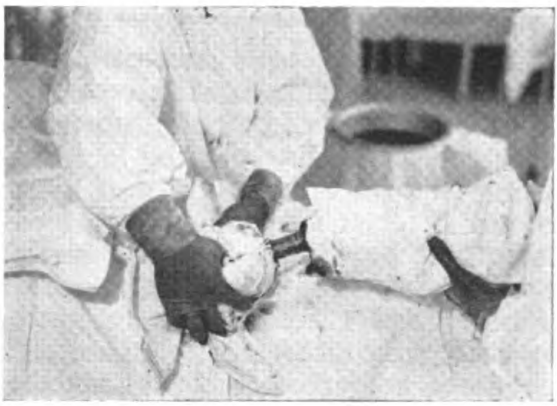


FIGURE 2

towel to the proximal stump. An assistant can retract the muscle by placing his fingers through the finger openings of the towel (figure 2). The surgeon may now saw the bone without interference from protruding muscle, instruments, or the assistant's hands. After the bone has been sawed, the towel is removed by simply lifting it off the stump.

PENICILLIN OPHTHALMIC OINTMENT

Because of the impracticality of continuous solution therapy with penicillin in overseas units, plus the instability at room temperatures, a preparation of penicillin sodium in an ophthalmic ointment base has been found applicable for external ocular infections, First Lieut. Samuel H. Stein, M.C., A. U. S., reports.

The ointment is made up of lanum anhydrous, U.S.P., 17 percent, white petrolatum, U.S.P., 51 percent, distilled water, U.S.P., 5 percent, mineral oil, light, U.S.P., 22 percent; 100,000 Oxford units of penicillin dissolved in 5 percent distilled water are incorporated in 7 grams of the ointment.

The penicillin ointment tested in vitro on a nutrient agar cup plate seeded with staphylococci produced an inhibition ring 50 mm. in diameter. After five weeks at room temperatures in the tropics, the penicillin ointment produced a 44-mm. inhibition ring. With this result, it is reasonably safe to state that penicillin ointment is, for all practical purposes, stable for at least one month at room temperatures.

Chronic blepharoconjunctivitis, corneal ulcers, and various types of conjunctivitis caused by a sensitive organism have responded effectively to this treatment. The speedy relief of the patient's symptoms and rapid subsidence of infection were evident under penicillin ointment therapy.

AID IN LOCALIZATION OF FOREIGN BODY IN THE EYE

In the problem of multiple foreign bodies in the orbit and, to a lesser extent, of single ones, it is often of great value if some of them can be ruled out as not being in the eye, without the process of charting the localization. The simple method of doing this roughly, suggested by Major Paul C. Langan, M.C., is not offered as a means of localization, as certain shadows falling at any place in the beam of x-ray which traverses the eyeball must be plotted to decide their nasal or temporal position. It is offered simply as a method of shortening the search by removing many from consideration.

A twenty-five-cent piece is about the diameter of the eyeball, which is fairly round, discounting the bulge anterior which amounts to about 1 mm. The Sweet localizer depends partly on the fact that after the ball-cone mechanism is "tripped," the ball is one centimeter from the cornea and its rod is

aimed in the mid-vertical, mid-horizontal plane intersection. If the arm for the ball shadow is projected and a perpendicular is erected to it at 1 cm. from the shadow, it should be tangential to the cornea. This relationship is not changed by the tube shift toward the feet. Allowing 1 mm. for the bulge, a twenty-five-cent piece may be placed on the film in such a manner that the projected line passes through the center of the coin. A light pencil line drawn around the coin will outline, approximately, the eyeball. This may be done on the second view as

well. All shadows falling within both of the circles should be localized, as should any which fall at the rim or just beyond it. Many will be to the nasal side or the temporal, but any which fall outside on one or the other, or both, need not be charted, thus shortening the work and diminishing the number of shadows which must be identified on both views as being due to the same foreign body.

It must be stressed that all foreign bodies appearing in both of the circles are not necessarily in the eyeball, and complete plotting should be carried out for them.

INTRAOCULAR FOREIGN BODIES

A study of intraocular foreign bodies in soldiers, conducted at the Army Institute of Pathology, has yielded information which is considered of immediate interest to Army ophthalmologists. Helenor Campbell Wilder, of the Institute of Pathology, Army Medical Museum, reports that foreign bodies were removed from 150 enucleated eyes during gross examination. Subjected to tests by a magnet, 61 gave a positive response, whereas 89 were nonmagnetic. In the former group, several appeared low in iron content, responding weakly to the magnet until they were

TABLE I

	Magnetic	*Nonmagnetic*
Explosion of:		
Shells	24	25
Bombs and hand grenades	4	4
Land mines and dynamite	3	19
Detonator caps	0	17
Gunshot wounds	1	5
Wounded in action (method not specified)	8	2
Accidents with tools	9	0
Miscellaneous accidents	0	7
Manner of incurrence not specified	12	20

cleaned and dried. Among the nonmagnetic foreign bodies, copper, lead, glass, vegetable matter, wool and cotton fibers, and eyelashes have been identified. The fibers and eyelashes were revealed on microscopic examination and were associated with other intraocular foreign bodies. There was also a miscellany of unidentified material which is being analyzed with the assistance of the Federal Bureau of Investigation. Attempted or, in the case of multiple foreign bodies, partial magnet extraction is recorded in twenty-eight eyes. As the histories are incomplete, it is impossible to say in how may other cases magnet extraction may have been attempted with either complete or partial failure, or how many clinically successful magnet extractions have been performed. In one instance 50 small fragments had been extracted at operation, but on gross examination multiple minute magnetic foreign bodies were found, and microscopic examination revealed multiple crystalloid particles, fibers, and cilia. The distribution of magnetic and nonmagnetic foreign bodies in relation to the modes of injury is shown in table I.

It would appear that failure of magnet extraction as an operative procedure can sometimes be explained by unexpectedly large numbers of nonmagnetic primary missiles introduced into the eye in combat injuries, by the low iron content of some of the magnetic foreign bodies, or by the frequent presence of secondary nonmagnetic missiles. The results of the foreign body analyses and of studies on pathologic reactions to various materials will appear in a future paper.

DIATHERMY TIP FOR RETINAL OPERATIONS

Many Army hospitals are equipped with electro-coagulating units for use in various surgical procedures. Instrument manufacturers have stated that with the standard unit "showering" or "sparking" occurs to such a degree when the coagulating current is used that it is unsuitable for use in retinal operations. To obviate this difficulty they have provided an adapter plug and handle which can be used with the cutting current. This adapter must be ordered separately. The electrodes supplied with the accessories for general surgical use are not satisfactory for ophthalmic work.

Since some hospitals are not equipped with the adapter and retinal detachment kit (Med. Dept. Item No. 9363600), Captain Arthur G. De Voe, M.C., reports that a perfectly satisfactory tip can be devised and used directly with the electrocoagulating unit. Such a tip has been used in a sufficient number of operations to demonstrate its practicability. The standard Army instrument is a four-gap portable Bovie electro-coagulating unit, manufactured by the Liebel-Flarsheim Company, Cincinnati, Ohio. With the tips shown (figure 1), no difficulty has been encountered in performing satisfactorily the usual surface and penetrating diathermy applications for repair of retinal detachments. "Showering" has not been excessive nor detrimental.

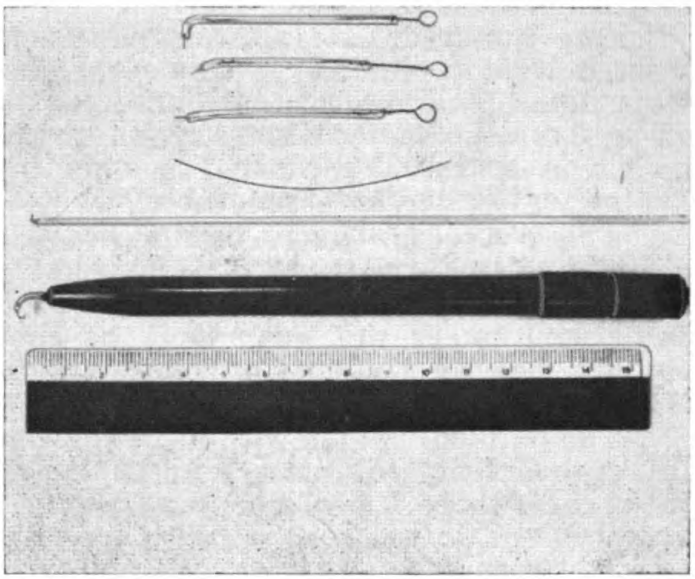


FIGURE 1. Showing (1) assorted tips, (2) wire stylet from 22-gage needle, (3) 2-mm. glass tubing, and (4) assembled tip and chuck.

Capillary glass tubing 2 mm. in diameter could be improvised from laboratory equipment. Fine steel wire, originally used as a stylet for 22-gage, 3-inch hypodermic needles, was found to be of satisfactory diameter and rigidity. The capillary tubing was bent over an alcohol lamp to the curvature desired, wire inserted into the tube, and the end sealed. The tip of the wire can then be cut or ground to any desired length or sharpness. It has been found desirable to seal the glass around the wire in order to prevent fluid from running into the tube by capillary attraction. This of course makes it impossible to lengthen or shorten the tip at will. In actual practice, however, when instruments with adjustable tips are used, it is the usual custom to set the tip at a predetermined length and leave it there throughout the operation. By having sealed tips of varied lengths and shapes, it has been found possible to change them rapidly during the operation if an alteration in penetration should appear advisable.

Different types of wire, including platinum and tantalum, have been found to offer no advantage over the wire described above. This diathermy tip has been presented merely because of the ease and economy with which it can be improvised to fit standard electro-coagulating units.

TREATMENT OF PNEUMONIA WITH SULFONAMIDES AND PENICILLIN

The purpose of this study was to gage the efficacy of penicillin as compared with the sulfonamides in the treatment of pneumonia and to determine its optimum dosage and mode of administration.

One hundred cases of pneumococcic pneumonia were treated with penicillin. It was recognized that these cases were not comparable to those observed in civilian hospitals, since they represented vigorous young adults in whom treatment was instituted early and in whom the response to adequate therapy should be favorable.

There were no deaths in either series, so that the usual criterion of the efficacy of therapy could not be used. Therefore, the fall of temperature and the white blood cell count, the resolution of the pneumonia as shown by x-rays, the sputum, and the incidence of relapses and complications were carefully analyzed.

The patients treated with penicillin showed a more abrupt fall of their temperatures to normal. However, in over half of these cases there was a secondary rise in the temperature to over 100° F. In contrast, only 9 percent of the sulfadiazine-treated cases showed such a secondary rise. There was no essential difference in the time required for the white blood cell count to return to normal and for roentgenologic resolution. Viable, virulent pneumococci were found in the sputum during and after therapy in every case treated with penicillin for as long as sputum could be obtained. These observations are essentially in agreement with those previously reported by Frisch in sulfonamide-treated cases. The incidence of complications and relapses occurring in the two groups was too small to permit one to draw definite conclusions, but the incidence in the penicillin-treated group was definitely smaller than in the sulfadiazine-treated group.

Attempts were made to determine the smallest amount of penicillin which produced clinical cures in these patients. Clinical results were good until the total dose was reduced to 60,000 units given over a three-day period. Satisfactory results were obtained in twenty patients with pneumococcic pneumonia treated with one or two daily intramuscular injections of a penicillin-beeswax mixture. Larger doses, at least 400,000 units, were necessary for cure in these patients.

Forty selected cases of severe atypical pneumonia were treated with 10,000 to 15,000 units of penicillin intramuscularly every three hours for three days. Forty similar cases were used as controls. It was concluded that penicillin had no

---

Abstract of paper by Lieut. Colonel J. Murray Kinsman, M. C., A. U. S., Lieut. Colonel Worth B. Daniels, M. C., A. U. S., Captain Samuel Cohen, M. C., A. U. S., Captain Joseph P. McCracken, M. C., A. U. S., Captain Constance A. D'Alonzo, M. C., A. U. S., First Lieut. Samuel P. Martin, M. C., A. U. S., and First Lieut. William M. M. Kirby, M. C., A. U. S., submitted through The Surgeon General's Office to the Journal of the American Medical Association.

effect on the clinical course of these patients, but that penicillin therapy should be employed in patients seriously ill with atypical pneumonia in whom the occurrence of a secondary bacterial infection might mean the difference between recovery and death.

The authors believe that the presence of viable, virulent pneumococci in the sputum during and following penicillin therapy indicates that the action of penicillin, like that of the sulfonamides, is merely to inhibit the growth of the organism and localize the infection. Actual recovery is brought about by the body's own defense mechanism. They, therefore, believe that, as long as an adequate dosage of penicillin is given, the duration of treatment is more important than large doses. Although three days of treatment gave excellent clinical results in their moderately severe cases, it would seem important to treat severe cases of pneumococcic pneumonia for at least six days.

PLAGUE IN RELATION TO U. S. TROOPS

With U. S. troops distributed widely over the globe, there is constant danger of Army personnel coming in contact with plague. During the winter of 1943-1944 in Suez, Egypt, and in the fall of 1944 in Dakar, French West Africa, local epidemics of human plague were threats to U. S. military personnel in the vicinity; however, spread to our troops did not occur, and as yet no cases have been reported among military personnel in other localities where human or sylvatic plague is endemic.

The Suez epidemic was preceded first by an increase in the *Xenopsylla cheopis* index for *Rattus norvegicus*, and then by plague in the rat population. The axiom that human bubonic plague is preceded by rodent plague was fulfilled and the value of the flea index as an indicator of an incipient epidemic was demonstrated. The suggestion by local authorities that the body louse (*Pediculus corporis*) was involved in transmission was unfounded. Control measures recommended by the Army and effected by the local government proved their value.

At Dakar, the Army had opportunity to test measures of prevention and control, many of which were new. For military personnel, reduction to a minimum of contact with the plague area was enforced. Visits to the native city were permitted only for essential business purposes. Natives employed on the military reservation were dusted with 10 percent DDT in pyrophyllite, accomplished without removing the clothing just as is practiced in delousing of individuals in typhus control. These natives were also given plague vaccine and required to remain on the post. Military personnel received booster doses of plague vaccine. A program of rodent control was vigorously executed in the military area. All buildings, including hospitals, barracks,

mess halls, and warehouses, as well as natural rat harborages on the reservation, were treated with DDT powder or residual spray solution to kill fleas. Every encouragement and assistance was given local authorities in their program of control. Military personnel whose duties required entry into a danger zone wore clothing treated with standard insect repellent and dusted with DDT powder. The necessity for chemical prophylaxis with sulfadiazine did not appear, and there was no opportunity to evaluate this procedure. The part that each procedure contributed to the result obtained is unknown, but there was no plague in U. S. military personnel.

As the war progresses in the Far East it is probable that there will be further opportunities for contact with plague. Important foci of human plague exist along most of the coast of China, as well as Manchuria, Indo-China, Malaya, and the entire route into western China through India and Burma. Vigilance to appreciate the danger and diligent application of preventive measures are needed to continue the protection of our troops from infection with *Pasteurella pestis*. Details concerning the preventive measures referred to appear in War Department Technical Bulletin TB Med 124, "Plague," dated December 1944.

VENEREAL DISEASE RATES

The over-all venereal disease rate for the first quarter of 1945 in continental United States is 44 per 1,000 per year; broken down, the rate is about 4 per 1,000 for syphilis, 39 per 1,000 for gonorrhea, and 1 per 1,000 for chancroid and other venereal diseases. This rate for 1945 is the highest attained during World War II (1941, 40.5; 1942, 39.3; 1943, 26.3; 1944, 33.1).

Continental United States only

	Days lost per 1,000 men per year	Average number days per case
1940	1,278	32
1941	854	22
1942	670	14
1943	473	10
1944	325	7
Currently	285	6

The venereal disease rate in theaters has varied widely, with low rates in SWPA, POA, and the Alaskan Department. The Mediterranean Theater has had consistently high rates; moderate rates have been recorded in the European Theater. The over-all venereal disease rate for all theaters was 32 per 1,000 in 1942, 34 per 1,000 in 1943, and 42 per 1,000 in 1944.

The total rate for the U. S. Army in zone of the interior and theaters was 30 per 1,000 in 1943 and 36 per 1,000 in 1944 (tentative).

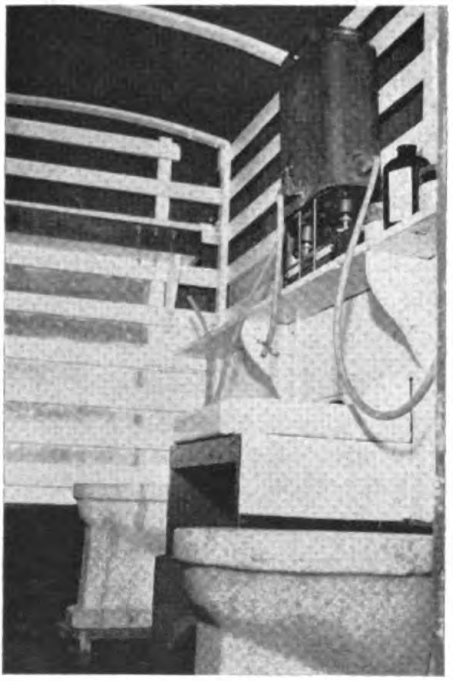
A steady decline has occurred in the number of days lost per 1,000 men per year and in the average number of days lost per case.

MOBILE PROPHYLACTIC STATIONS

Among troops engaged in convoy duties, the provision of satisfactory prophylactic facilities for venereal disease control is a perplexing problem. To meet this problem a battalion surgeon* in an overseas theater built and put into operation six mobile prophylactic stations which are simple in construction. The basic construction of this unit consisted of raising the height of the roof of a one-ton cargo trailer to 75 inches and installing warm water and drainage facilities. The side walls of the trailer were left open by raising the tarpaulin. This was covered with cello-glass and the rear of the trailer was inclosed with the same material except for a light frame door. Inside was a medicine and supply cabinet, sterilizer, hot water heater, and a tent stove to heat the trailer; also, a 5-gallon can, a faucet, and urinal serving as a sink. The gasoline rack is outside on the trailer. Some improvements later over the old trailer were the addition of a sliding panel door, green light, the duckboards, and three bidets instead of two.

Mobile prophylactic station trailer of the 28th Quartermaster Battalion.

The mobile prophylactic trailer can be hooked up to a jeep, ¾-ton weapons carrier, or a truck, and as many trailers as necessary can be added, and conversely one can take away as many as necessary from the original group. The trailers can be placed anywhere quickly, and while not intended to take the place of the permanent prophylactic stations, they may be used to advantage in certain circumstances: (1) Should a sudden influx of troops occur in a large city, the permanent prophylactic stations would be



Interior view of mobile prophylactic station, 28th Quartermaster Battalion.

An abstract.
*Captain Jacob Wexler, M.C.

inadequate; but 10 or 20 mobile prophylactic trailers could be easily and quickly operated throughout the city. If the troops move out in a week, the trailers can also be moved out. (2) When troops return from the States and concentrate for a short period of time at ports, add mobile prophylactic trailers or subtract them as required when the troops leave. (3) Mobile trailers could be rushed to small towns on fighting fronts when an unusual congregation of soldiers occurs or when a prophylactic station is not present or is inadequate.

Since these mobile stations were instituted, the author reports, a steady decline in venereal diseases has occurred in his battalion, each company of which has a mobile station of its own, supervised by the surgeon.

VISCERAL LEISHMANIASIS (KALA-AZAR)

A number of cases received in Army hospitals of the United States with the diagnosis of fever of unknown origin are being found to be kala-azar. These infections originate in the Mediterranean Area, India, or China. Medical officers should be on the lookout for such cases. The history is often not enlightening. The temperature curve often fails to show the characteristics described in textbooks. The outstanding physical signs are splenomegaly and hepatomegaly, occasionally with lymph node enlargement. The blood shows anemia and, especially, leukopenia. With these findings in a patient from an endemic area, a strongly positive aldehyde, Ray, or Sia test should raise to a high level suspicion of kala-azar. Leishman-Donovan bodies practically cannot be found in blood smears, and blood cultures for this organism require special technique. The organism is readily demonstrable, however, in suitable preparations of splenic pulp, liver tissue, bone marrow, or in many cases, lymph node tissue. Diagnostic puncture should be performed when indicated, using proper precautions. Chemotherapy should be promptly instituted.

PENICILLIN AND A CASE OF RELAPSING FEVER

A case of relapsing fever, acquired in Texas, in which penicillin was administered has been reported by Major Isadore Fischer, M. C., of the Station Hospital, Camp Bowie, Texas. The diagnosis was made by demonstration of spirochetes in the patient's blood and in the blood of an inoculated mouse, but only after the patient had had four relapses. Penicillin in the amount of 60,000 units was then given in physiologic saline by continuous intravenous drip in six hours. Following this, the patient received intramuscular injections at three-hour intervals for four days, until a total of 650,000 units of penicillin had been given. The temperature became normal twelve hours after treatment was started, and no relapse had occurred seventy-two days later.

A CALL FOR HISTORICAL REPORTS

The end of the war in Europe closes a momentous chapter in the nation's military history, and the Medical Department has played an important role in the successful outcome of that conflict. History was made in all phases of military medicine from the time our troops first landed in Africa and Europe until the final shot was fired. The pressing task of caring for the sick and wounded has until now far outweighed all other activities, including the writing of history. But now that the conflict has ended, the time is at hand to appraise the Medical Department's record in ETO, MTO-NATOUSA, the Middle East, and Persian Gulf Command. The required historical work must be carried out without delay before records become scattered or inaccessible—before time dims the clear-cut memory of events just passed.

Although historical officers in each theater headquarters have assembled much information currently, it has been impossible for them to cover the full scope of the medical service in the field. Activities in theater headquarters and reports of medical units, important as they are to the history, will not yield all the information necessary to a full-bodied account of what the medical service has achieved. In this connection, it should be recalled that War Department Memorandum No. 40-45, dated 30 March 1945, subject, "Period Reports, Medical Department Activities," specifically directs that reports be submitted prior to relief from duty by all medical units for any period of service within the theater of less than a calendar year as well as for a full calendar year. Some of the most revealing material for historical purposes, however, will come from field experiences based on the personal observations of officers. Since material of this nature is not often recorded in official reports, it would enrich the history if every officer who has participated in unusual operations would make it his duty to render an account of his experiences. If this is not done, the medical history of the war will lose much of its value. This, then, is an appeal to all officers who have served in ETO, MTO-NATOUSA, the Middle East, and Persian Gulf Command to submit written reports *now* covering any activity of unusual interest. The Historical Division of The Surgeon General's Office has been loath to emphasize this request heretofore in view of the heavy responsibilities which Medical Department officers have borne. The cessation of hostilities, however, may permit officers to devote at least a portion of their time to recording the history which they have made. It is known that some affiliated and other hospital units are contemplating histories to be published under private auspices. While the preparation of such unit histories is to be encouraged, it should be clearly understood that they will not be published as a part of the official history. Consequently, af-

filiated units must continue to submit the necessary official and unofficial reports.

It should not be thought that only the more spectacular achievements of the Medical Department are historically important. Frequently, observations that may seem commonplace will later prove to be unusually significant. Thus, there is no limit to the range of subject material upon which officers may write. But there is a time limit involved in bringing together the written record of the role of medicine in the European war. The fulfillment of this historical mission is a matter of the utmost urgency and all corps of the Department —Medical, Dental, Nursing, Veterinary, Sanitary, Dietitian, Physical Therapy, Administrative, and Pharmacy—are requested to respond to this call.

SHOWDOWN INSPECTIONS OF EQUIPMENT

Because of the increased tempo on the war fronts, one great problem of stations has been to supply and equip alerted units. When units have reached a designated priority under POM requirements, they are directed to have a showdown inspection at which all authorized equipment is examined to determine its combat serviceability for not less than a six-month period. It has become more and more apparent that unit supply officers need all the assistance they can get during the time of their showdown inspections and in the preparation of their shortage reports.

One station has reported that the post medical supply officer or his representatives attend all showdown inspections of local units and, after a complete check of all equipment, the excess and unserviceable equipment are turned in to him. On completion of the inspection, units are requested to pack and store for overseas shipment all complete equipment not essential for current training. This procedure is advantageous in preventing last-minute shortages and losses. The equipment unserviceable for overseas often can be reissued to units in training. After the showdown inspection, shortage reports are submitted to the post medical supply officer, who fills as many shortages as possible from station stock, issued in order of the priority of the unit. Items which cannot be furnished from station stock are placed on special POM requisitions and forwarded to the distribution depot in that area.

This courtesy service rendered by the post medical supply officer has been of great assistance to the units and has the wholehearted approval of The Surgeon General. Wherever practicable, it is recommended that other stations follow the same procedure.

POLICY ON DISCHARGE OF MEDICAL DEPARTMENT PERSONNEL

In announcing a policy on discharges in conformity with War Department procedures, Surgeon General Norman T. Kirk said that substantial releases of Army Medical Department personnel will not take place before the latter part of this year. This is due to the fact that the peak of the Medical Department's activities will not be reached until fall.

In formulating the policy consideration was given to civilian needs for professional medical, dental, and veterinary care without weakening military needs. Other factors considered were the length of time necessary for personnel to complete their work in the Mediterranean and European Theaters and return to the United States, replacement of Medical Department personnel in active theaters by those who have not had overseas duty, necessity for the maintenance of a high standard of medical care, the heavy load of patients in the United States, evacuation of the sick and wounded from Europe in the next ninety days, and continuing medical service in the Pacific.

The policy applies with equal effect to Army medical officers assigned to the Veterans' Administration and other agencies. It reads:

MEDICAL CORPS AND DENTAL CORPS

1. Officers whose services are essential to military necessity will not be separated from the service.
2. Officers above 50 years of age whose specialist qualifications are not needed within the Army will receive a high preferential priority for release from active duty.
3. Adjusted Service Ratings will be used as a definite guide in determining those who are to be separated.

MEDICAL ADMINISTRATIVE CORPS AND SANITARY CORPS

1. Officers whose services are essential to military necessity will not be separated.
2. Officers who express a desire to stay on duty will be allowed to do so if vacancies exist. In the event there are more wishing to stay than there are vacancies, those with the highest efficiency index will be retained.
3. Those who wish to be released will be selected on the basis of Adjusted Service Scores.

ARMY NURSE CORPS

1. All nurses whose husbands have been released from active duty will be discharged upon request when release of husband is proved.
2. No officer will be separated whose services are essential.
3. Officers with children under 18 years of age who wish to be released will receive a high preferential priority for selection.
4. Adjusted Service Scores will govern other cases.

DIETITIANS AND PHYSICAL THERAPISTS

1. All Medical Department dietitians and Medical Department physical therapists whose husbands have been released from active duty will be discharged on request when release of husband is proved.

2. Military necessity will govern all others. Since there is a shortage of these officers, it is not contemplated that others will be released from the service except in paragraph 1 above.

VETERINARY CORPS

1. Since there are insufficient officers to meet the present requirements, it is not contemplated that any officers will be released from the service.

REFRESHER PROFESSIONAL TRAINING FOR DENTAL OFFICERS

Refresher professional training is authorized for officers of the Army Dental Corps who, because of assignments to command, administrative, or limited professional duties, have not been engaged in the professional aspects of general dental service during the past twelve months or more (ASF Circular No. 155, 1 May 1945, Part One, Section II). The training will be voluntary, and priority for such training will be given to officers who have served overseas; however, training will not be limited to those who have served overseas.

The refresher training is not intended for the specialist or the general dental officer who wishes to take some special work in exodontia, oral surgery, prosthetics, or operative dentistry, but it is set up for the dental officer who is interested in spending about three months on a rotation basis in all phases of general dental service. A maximum of five dental officers will be given training in an A.S.F. general hospital, and twenty-four hospitals have been approved in continental United States.

Requests for this training will be initiated and submitted through proper channels by the individual officer concerned who believes he is eligible. Officers selected for this training will be ordered on temporary duty, with per diem, for a period of not more than twelve weeks.

VOLUNTEERS FOR SERVICE IN THE VETERANS' ADMINISTRATION

The Veterans' Administration is in need of doctors to assist in the care of veterans. These veterans are from both world wars and are entitled by law to medical treatment. A certain number of Army medical officers have been detailed to assist in the medical care of veterans, and some more will be needed in the near future. Any medical officer who is interested in being detailed to the Veterans' Administration, while still retaining his Army status, should write his request to The Adjutant General through military channels.

POLICY CONCERNING DISCHARGE OF NONEFFECTIVES

The policy of the War Department concerning the disposition of noneffective personnel is outlined in War Department Circular No. 81, 13 March 1945. Medical evacuation, reclassification, and discharge are for those incapacitated for service by illness, injury, or disease. Noneffectives who are not disabled are to be disposed of by command through nonmedical channels. Enlisted men who have demonstrated inadaptability for military service but whose psychiatric or physical condition is not such to warrant a disability discharge will be disposed of as directed by the approved proceedings of a board of officers convened under AR 615-368 or AR 615-369. When an officer has demonstrated inadaptability to his assignments and his psychiatric and physical condition is not such as to warrant appearance before an Army retiring board, prompt measures will be taken to initiate reassignment or reclassification under AR 605-230.

The diagnosis of any type of psychoneurosis implies sickness and disability of some duration. It is not to be applied for reasons of expediency in order to effect a disposition. It will be applied only when its use is justified by the existence of a clinical picture which satisfies the criteria for psychoneurosis as established by good medical practice. The mere presence of psychoneurotic symptoms which do not significantly impair the individual's efficiency or the presence of a predisposition to psychoneurosis does not warrant the diagnosis of any type of psychoneurosis. Such individuals if otherwise sound will be considered as having no disease.

In determining disposition of cases, it must be clearly understood that there are many causes for noneffectiveness other than sickness. Among these are inaptness, inadaptability due to emotional instability, lack of physical stamina, misassignment, defective attitude, and unwillingness to expend effort. Those who are ineffective by reason of any of these causes will be disposed of administratively.

There has been a tendency to attribute noneffectiveness to coexistent medical defects such as flat feet, lumbosacral strain, or mild psychoneurosis, when actually these defects were not in themselves significantly disabling and the primary cause of the noneffectiveness was nonmedical—e.g., inaptness, inadaptability, defective attitudes, etc. A medical defect does not in itself constitute adequate cause for medical discharge unless the defect in itself is genuinely disabling for military service.

It should be clearly recognized that the presence of any type of psychoneurosis should not lead automatically to separation from the service. Many individuals with psychoneurosis recover or even if not fully recovered are capable of performing full duty. The disposition should depend solely on the degree of incapacity after adequate treatment. In itself, a

mild psychoneurosis of any type will not be considered adequate cause for disability discharge. When an individual is suffering from a psychoneurosis which is not incapacitating he will be returned to duty.

COMMAND RESPONSIBILITY FOR MENTAL HEALTH

The majority of the factors which determine the mental health of military personnel are functions of command. In other words, the main job of preventive psychiatry must be done by commanding officers of the line. It is a responsibility of command to obtain maximum utilization of manpower by providing proper incentive and motivation, and such reclassification, reassignment, rest, relaxation, and recreation as exigencies of the military service permit. The psychiatrist acts as adviser to the command. In training centers or in Army divisions as a member of the division surgeon's staff, he is to be regarded as having a staff function in advising the command on policies and procedures which affect mental health and morale. In certain divisions and in some commands there appear to be excellent morale and splendid accomplishment which are in part due to an ideal relationship between the psychiatrist, the surgeon, and the responsible officers of the command. It is the responsibility of the psychiatrist to be alert to the situational factors which are precipitating psychiatric disorders and to recommend the measures necessary to alleviate or remove these factors. He should survey the training program from a psychiatric viewpoint, advise concerning schedules, the method of conditioning troops to battle situations, and adjustment to extremes in climate. He should pay close attention to such matters as the furlough policy and the handling of AWOL cases. Through collaboration with the personnel classification officer he should be able to prevent many psychiatric disorders by bringing a medical viewpoint to bear in the job assignment problems. He should be alert to evidence that troops are approaching the limit of their endurance and are in need of rest. He should be equally alert to untoward effect of boredom from excessive idleness. He should advise other agencies which are important to the morale and mental health of the troops: the information and education officer, the chaplain, the Red Cross, and the special services officer.

Ninety Cases of Fractured Jaws.— A U.S. Army general hospital in Italy made the following report of causes of fractured jaws and the type of fixation employed in treatment, for the six-month period ending 15 March 1944: fractures resulting from missiles, 63, and fractures resulting from blunt force, 27 (battle casualties, 73; nonbattle casualties, 17). Fractures involving mandible, 54; fractures involving maxilla, 19; fractures involving zygoma, 12; fractures involving multiple facial bones, 5. Cases treated with loop wiring and intermaxillary elastic traction, 38; cases treated with external pin fixation, 5; cases returned to duty, 47.

CONFERENCE ON NEUROPSYCHIATRY

A conference of the service command and civilian consultants in neuropsychiatry was held on 20-21 April in The Surgeon General's Office. The meeting was arranged by the Neuropsychiatry Consultants Division, to review neuropsychiatric policy and to discuss neuropsychiatric problems met in the field. The conference was also attended by the director of the School of Military Neuropsychiatry, representatives of the various divisions in The Surgeon General's Office, the Air Surgeon, and the Chief Surgeon of Army Ground Forces.

The meeting was opened by Major General Norman T. Kirk, The Surgeon General, and was presided over by Colonel William C. Menninger, chief consultant in neuropsychiatry. Among the topics discussed were problems relating to induction, hospitalization, reconditioning, clinical psychology, psychiatric social work, mental hygiene consultation services, neurology, rehabilitation centers and disciplinary barracks, the School of Military Neuropsychiatry, preventive psychiatry, and psychiatric personnel. The final afternoon of the conference was devoted to comments of the various service command consultants on problems not covered otherwise and all of the various neuropsychiatric activities in their respective commands. Also, reports of committees on hospitalization, personnel, redeployment, consultation services, and problems of the military offender were read and discussed.

PHYSICAL RECONDITIONING FACILITIES IN CONVALESCENT HOSPITALS

The objectives of physical reconditioning for patients in convalescent hospitals are: (1) to develop an adequate level of general over-all physical fitness, (2) to bring about the fullest possible recovery of weakened and disabled tissues, (3) to provide for participation in sports and games which will bring pleasure, satisfaction, self-expression, and release from tension, and (4) to develop interest in and to provide instruction in recreative sports which patients can employ in their present and future leisure. To accomplish these objectives, adequate facilities and equipment have been provided to such an extent that the athletic plants at our convalescent hospitals compare favorably to the average standards in our universities.

A large percentage of patients in convalescent hospitals require remedial exercises. Physical reconditioning personnel supplement physical therapists in providing these exercises. In addition to physical therapy facilities, remedial gymnasiums are available on the basis of 5,000 square feet per 1,000 patients. Swimming pools which are used for remedial exercises as well as general exercise and recreation are provided on the basis of one pool (40 by 100 ft.) per 2,000 patients, the first to be inclosed and heated.

Because of the value of athletics from the physical and psychological standpoint, they are used extensively in convalescent hospitals. Every effort is made to adapt the athletic activities to the disabilities of patients.

Emphasis is devoted to teaching patients recreative sports which have a remedial as well as recreational aspect. This requires a varied program of indoor and outdoor activities. One gymnasium is available for each 1,500 patients, or major fraction thereof. Sixteen bowling alleys are provided for the first 2,000 patients, with four alleys for each additional 1,000 patients. The outdoor facilities include one baseball diamond with bleachers, one outdoor boxing ring, one football field for patient capacity up to 3,500 and two for capacity of 4,000 or over, four outdoor handball courts, three softball diamonds, four volleyball courts, six tennis courts, one archery range with four targets, five badminton courts, ten horseshoe courts, one putting green, two basketball courts, two croquet courts, four shuffleboard courts, per 1,000 patients, and one golf driving range with a capacity of ten men for up to 3,000 patients and twenty men for capacities above 3,000. In addition, stables for forty riding horse are provided.

DIAGNOSIS OF PSYCHONEUROSIS

The term psychoneurosis will no longer be used on individual clinical records. This does not mean that the term is "abolished." It will continue to be used for statistical purposes and for reference to the broad group of cases which fall in that category. The method of recording the diagnosis is outlined in the following paragraphs:

The various types of psychoneurosis such as anxiety state, conversion hysteria, etc., are sufficiently well defined to justify their use without being prefaced by the term "psychoneurosis." This term will therefore no longer be used on individual clinical records. Instead the particular type or types of psychoneuroses and the severity will be recorded as the diagnosis. In every case this will be followed by a statement of the degree and nature of the external stress which has precipitated the disorder and an estimate of the extent of the individual's predisposition.

The terms "operational fatigue" and "exhaustion" are acceptable as working diagnoses for psychiatric disorders incurred as a result of combat or other severe stress until a definitive diagnosis has been established.

NEUROPSYCHIATRIC TREATMENT SECTION OF CONVALESCENT HOSPITALS

The neuropsychiatric sections of convalescent hospitals have been established to render definitive treatment to patients with psychoneuroses who are not in need of general hospital type care or intensive individual therapy. Since the designation "Neuropsychiatric Reconditioning Section" does not convey this concept, it has been recommended by The Surgeon General that the name be changed to "Neuropsychiatric Treatment Section."

PRIZE FOR ESSAY ON PSYCHIATRIC HOSPITAL CARE

A competition on the subject of improving the hospital care for psychiatric patients, being held by the Modern Hospital Publishing Company, 919 North Michigan, Chicago, Illinois, is open to psychiatrists, psychologists, social workers, nurses, therapists, hospital administrators, former patients, and other interested persons. The three prizes will be $500, $350, and $150. The essays should not exceed 5,000 words and preferably should be shorter, typed with double spaces, and the original and two good carbon copies mailed to reach the above address not later than 1 October. Those mailing essays from abroad should allow sufficient time for transport.

The three judges, outstanding authorities on hospital treatment of psychiatric patients, will be from the United States Public Health Service, the American Psychiatric Association, and the National Committee on Mental Hygiene. The essays must have no mark or name which would identify the author, but with each one must be included a plain, opaque, sealed envelope with no name on the outside, but containing the name and address of the contestant. Contestants are urged in their essays to use imagination and present new and promising ideas. What is not wanted in this contest is a psychiatric medical treatise. The contestant's plan for improving hospital care of psychiatric patients should not be narrow, but it can attack the entire subject from a special point of view such as that of the administrator of a hospital, that of the psychiatric social worker, or nurse, or attendant, or public relations director, or the patient himself and his relatives. The winners will be announced on or before 31 December and notified by telegram.

U. S. Army nurses in New Guinea spend their spare time cultivating a vegetable garden. 1942. Signal Corps photograph.

THE PROTEIN TYROSINE REACTION IN MALARIA AND EPIDEMIC HEPATITIS

The authors made blood protein tyrosine tests using the method of Proske and Watson on patients with relatively acute *Plasmodium vivax* malaria, three months after they had left the malarious district. They found the tests of limited diagnostic value, because 40 percent of the patients with positive blood films had normal blood protein tyrosine reactions. They found, in this study also, that the test was of no value in predicting relapses. Proske and Watson had previously reported[1] that the blood protein tyrosine was elevated in patients with malaria, and even in some patients with clinical malaria in whom positive thick blood smears were negative for malaria parasites.

While the authors' findings conflict with those of Proske and Watson, it should be noted that the two studies were done on two different groups of patients and in different circumstances. In one group the patients lived in an endemic area and probably suffered from chronic malaria; in the other group the patients had relatively acute malaria and were studied in a temperate, nonmalarious region where they were not exposed to reinfection as the patients in the former group were. The seeming disparity of the two sets of observations may indicate an important feature in malaria, for if the protein tyrosine is increased in patients in endemic areas where they are subject to reinfection and not in patients who have been removed from malarious areas, then some alteration in the blood protein has occurred, the nature of which is at present unknown.

During the course of this study, blood protein tyrosine reactions were made on patients suffering from diseases other than malaria, and it was noted that the protein tyrosine was frequently elevated in patients suffering from epidemic hepatitis; in fact, in all but 2 of 27 such patients examined. One of the 2 patients had a 1-plus and the other a 3-plus cephalin flocculation test. The 2 cases are of interest, for if normal protein tyrosine levels and positive cephalin flocculation tests occur in acute epidemic hepatitis, then these tests will not infallibly differentiate between obstructive and nonobstructive jaundice. Two- or 3-plus cephalin flocculation tests were seen in cases with normal protein tyrosine values and also in a few apparently healthy individuals. Generally the protein tyrosine level paralleled the clinical course and thus was useful in predicting the probable length of hospitalization.

Much work has been reported in the literature which indicates that in parenchymatous liver disease there is a disturbance of serum globulin. Although there may be no

---

Abstract of a paper by Lieut. Colonel William B. Wartman, M.C., A.U.S., and Captain Nathan Shlimovitz, M.C., A.U.S., submitted through The Surgeon General's Office to the Journal of Clinical Investigation.

1. Proske, H. O., and Watson, R. B.: The Protein Tyrosin Reaction; A Biochemical Diagnostic Test for Malaria, Pub. Health Rep., Wash., 54:158-172, 3 Feb. 1939.

change in the total albumin globulin ratio, the relative amounts of individual globulin fractions may be altered, and the protein tyrosine reaction measures one of these fractions—namely, that precipitated by 14 percent sodium sulfate. The exact nature of this fraction is not known, but it is usually called euglobulin. If it can be established that euglobulin is the same as the fractions separated by electrophoresis,[2] then the protein tyrosine reaction will provide a simple means of analysis which can be made in any clinical laboratory.

GRAPHIC PORTFOLIO ON MALARIA

A valuable aid for the instruction of troops in the subject of malaria is the War Department Graphic Training Aid 8-4, titled "Graphic Portfolio on Malaria," which was initiated by the Army Air Forces. The portfolio, measuring 30 by 40 inches, consists of twenty-four illustrated pages mounted on a display stand and subject matter explaining the cause of malaria, its prevention, and control. Suggested texts for the instructor are printed on the back of the illustrations to serve as a guide. The portfolio is designed as a visual aid to assist unit instructors in presenting the subject of malaria in such a manner that it will be readily understood by troops. Requests for the training aid should be directed to the local Adjutant General depots.

2. Gray, S. J., and Barron, E. S. G.: The Electrophoretic Analyses of the Serum Proteins in Diseases of the Liver, J. Clin. Invest., 22:191-200, March 1943.

Dental officer with his assistant, of 328th Infantry Regiment of Third Army, in Germany, work on the teeth of Pfc. Robert Higby, Chillicothe, Ohio. 21 February 1945. Signal Corps photograph.

THE DENTAL CORPS IN CHINA

China, formerly part of the China-Burma-India Theater of Operations, is now a separate theater in which the theater dental surgeon is Lieut. Colonel Richard D. Darby, D.C. This theater has the longest line of communication in the world. It requires the transhipment of supplies from ports of debarkation in India, together with repackaging, over the "hump" to China. The equipment, instruments, and supplies of Medical Department Chest No. 60 are used for general operative work. Although these chests do not contain the latest in design of dental chairs and units or the many choice instruments, they have proved adequate and adaptable to any type of field service. The dental prosthetic laboratory started to operate early in February 1944. The lack of equipment and supplies was a major handicap. For example, an acetylene generator had to be built that would assure the laboratory a supply of gas. Carbide gas was installed late in 1944. This laboratory, with only two dental officers and seven enlisted men, accomplished the following during the last quarter in 1944: full dentures, 67; partial dentures, 268; rebased dentures, 17; repaired dentures, 105; bridges, 44; miscellaneous services, 54.

The first dental class in China for the training of Chinese Army Medical and Pharmacy Corps officers was in Tali, Yunnan Province, November 1943. The course, which was limited to one month and which was conducted by the U. S. Army Dental Corps, presented the fundamentals of oral surgery and treatment of oral diseases. The need was very evident since the Chinese Army had no provisions for the care of its troops dentally. The curriculum was divided into three phases as follows:

First week. Lectures on general anatomy of the head and neck, dental anatomy, histology, physiology, splinting and first aid for fractures, and various diseases as well as infections of the oral cavity.

Second week. Demonstrations on the preparation of procaine solutions, sterilization, injections, and extractions.

Third and fourth weeks. Clinical practice. There were thirty students who graduated from this school, and each graduate was given a kit consisting of: one upper forceps, one lower forceps, one elevator, one mouth mirror, one cotton pliers, and a 2-cc. syringe. All work was done with these instruments, and each student performed a minimum of fifty extractions.

Travel conditions were such that it was necessary for the students to travel as many as twenty days to reach the school. It was decided to disband the school at Tali, and to have the instructor travel to the various divisions to conduct the school.

In the division schools the students were drawn from different units of the division so that each main component would have an individual capable of giving emergency dental treatment. The instruction was much the same as outlined for the school at Tali, except that the lecture time was cut. Each unit in the division was surveyed to determine the dental needs,

and the necessary treatment was completed by the class. It is most significant that during such training in the division the dental appointments had priority over all other military training or duties. There were four classes, representing seven divisions, and thirty-three students graduated.

A school also was opened at Kweilin, China, 24 April 1944, with the number of students limited to twelve. Two classes graduated and a third was in progress when a change in the tactical situation warranted the close of the school on 25 July 1944. There were two girl students, nurses in the Chinese Army with the rank of second and first lieutenant, who took the course. A total of twenty-four students graduated from the school at Kweilin and twelve more students were trained in part.

DENTAL SERVICE IN THE INVASION OF SAIPAN

A captain of the Dental Corps and three enlisted men were with the forward echelon in the invasion of Saipan. They debarked on Saipan, 25 June 1944, and for six days the captain did minor surgery and gave anesthetics. The remaining part of the station hospital's staff (three dental officers and six enlisted men) did not arrive until 1 August. Most of the dental equipment designated for this island was lost in a shipwreck. A few M.D. Chests No. 60 finally arrived, and the following Japanese dental equipment was salvaged: four hydraulic dental chairs, one S.S. White nonhydraulic chair, three instrument chair stands, two wall brackets, one instrument sterilizer, one dressing sterilizer, two wash bowls, and two sterilizing holders.

With all these difficulties, from 25 June to 1 January 1945, the following dental service was accomplished: fillings, 705; gum treatments, 422; new dentures, 151; repaired dentures, 184; new bridges and crowns, 25; repaired bridges and crowns, 30; teeth replaced, 705; x-rays taken, 1,387; teeth extracted, 400; fractures reduced, 12; and prophylaxis, 110. There were many other miscellaneous treatments given in the dental clinic. Furthermore, emergency treatment was given to some sixteen thousand civilians who were interned, in which work a Japanese dentist was used by the U. S. Army dental officers to assist. The dental clinic was set up in one-half of a Quonset hut, except for the dental laboratory which was housed in a large tent. The dental clinic and laboratory moved to a new location on 29 December 1944 in a Quonset hut, which was 20 by 96 feet.

Meritorious Service Unit Plaque.—The Meritorious Service Unit Plaque has been awarded to the 1798th Service Command Unit, Station Complement, Headquarters Detachment, Veterinary Section, Fort Des Moines, Iowa, for superior performance of duty in connection with food inspection activities throughout the State of Iowa during the last four years.

NEW GUINEA MOUTH

A recent report from the Southwest Pacific referred to an oral condition, which was seen on a few occasions, as "New Guinea mouth." The outstanding characteristic of these cases was sloughing of the interdental papillae, which exposed the bone between the teeth for areas varying from 1.5 to 3 cm. in size. They exhibit considerable pain. Smears from these areas present the typical picture of virulent Vincent's stomatitis. The spirochetes have three or four loops, and there are few fusiform bacilli. Surgical cement was used to cover denuded bone of the alveolar crests, and this treatment was retained for five or six days. Other routine treatments for Vincent's stomatitis were established.

THE JAPANESE ARMY DENTAL SERVICE

A report received from the Southwest Pacific Area indicates that dental treatment in the Japanese Army was provided by civilian dentists prior to 1941, in which year the dental corps of the Japanese Army was organized under the direction of the medical department, with a major general as chief dental surgeon. Since 1941, graduates from dental schools are called into service, on probation, with the rank of second lieutenant. Following the probationary period, they enter the Army Medical College at Tokyo, where they receive training for three or more months, depending on the need for army dental officers.

Dental officers are held responsible for training dental noncommissioned officers who perform some professional services. There are, it is reported, two dental officers, two dental noncommissioned officers, and two dental assistants assigned to army general hospitals. The line-of-communication hospitals, which usually have 1,000 beds, have at least one dental officer and some enlisted personnel.

The field hospitals, ordinarily 500-bed capacity, have one dental officer and enlisted personnel. These hospitals, generally attached to divisions, are very mobile and dental service is limited.

Each division has two dental officers. There is no documentary evidence that dental officers are assigned to regiments, battalions, line-of-communication headquarters, or supply units. It is assumed that only emergency dental treatment is provided for such units by trained enlisted personnel.

It was reported that the Japanese soldiers had considerable trouble with dental caries and gingivitis, and that treatment was often rendered by medical officers. The soldiers usually prefer this, because prior to the establishment of the dental corps, the medical officers afforded most of the dental service, which consisted principally of extractions and treatment of infectious conditions.

The equipment of the Japanese dental officer is reported good and adequate; however, there has been no evidence of availability of prosthetic dental treatment in any dental installation. Fillings are made of metal and a composition material believed to be some type of acrylic or cement.

SECOND AWARD OF THE STRONG MEDAL

The American Foundation for Tropical Medicine on 5 February 1945 awarded the Richard Pearson Strong Medal for distinguished service in tropical medicine to Rear Admiral Edward R. Stitt, retired, formerly Surgeon General of the U. S. Navy. The presentation was made on behalf of the Foundation by Colonel Richard P. Strong, for whom the medal was named and to whom the first award of the medal was given on 28 February 1944. Admiral Stitt, a native of North Carolina, was appointed an assistant surgeon in the Navy in 1889 and became medical director with rank of rear admiral in 1917. He was a teacher in the U. S. Navy Medical School, in the Medical School of the University of the Philippines, at Georgetown and George Washington Universities, and at Jefferson Medical College. He was appointed Surgeon General of the Navy in 1920 and reappointed in 1924. Admiral Stitt is the author of "Practical Bacteriology, Haematology and Animal Parasitology," the ninth edition of which was published, with coauthors, in 1938, and of "Diagnosis, Prevention and Treatment of Tropical Diseases," the fifth edition of which was published in 1929; the sixth and seventh editions of these widely known volumes were rewritten by Colonel Strong, in which work Admiral Stitt provided much assistance and inspiration. In conferring the second award, Colonel Strong said, "Admiral Stitt is an exponent of scientific truth in his medical publications and reviews. His leadership, inspiring example, and devotion to work in the field of tropical medicine through many years have justly won for him the epithet of 'Father of Tropical Medicine in the United States.' "

Dental Officers on Hospital Ships.—According to Tables of Organization and Equipment No. 8-537, 3 March 1945, the following grades and types of dental officers are assigned to hospital ships for duty: 1,500 bed—one lieutenant colonel (general dentist), one major (oral surgeon), and two captains or first lieutenants (general dentists).

The hospital ships vary in capacity from 200 to 1,500 beds, and lieutenant colonels (with comparable staff as cited in 1,500-bed hospital ship) are assigned to the 900-, 1,000-, and 1,500-bed units. A major (oral surgeon) is the highest ranking dental officer in the 500- to 800-bed hospital ships, while one captain or first lieutenant carries the dental responsibilities in the 200-, 300-, and 400-bed hospital ships. The function of the hospital ship is to provide professional care for the sick and the wounded evacuated from the theater of operations to the zone of the interior, for intra-theater transfer of patients by water, and for support of amphibious loading operations.

SHORTAGE OF X-RAY FILM

Perhaps no widely used item of medical supply is more critically scarce than x-ray film. Although the quantities allocated to the Medical Department have steadily increased since the beginning of the war, the requirements curve has climbed even more sharply due to the large number of battle casualties. With increased separations from the service, terminal examinations will impose an additional drain on the supply of this item. It is of the utmost necessity, therefore, that x-ray film be conserved in every practicable way.

Except where required by regulations, an x-ray study should not be made when there is no clinical reason to suspect disease or injury in the area under consideration. Follow-up x-rays should be employed only after procedures believed effective have been instituted, or after the lapse of an interval of time sufficiently long to cause a significant change. Flat films should be used instead of stereoscopic films whenever they will suffice. The smallest size film that will serve the purpose should always be used. X-ray film is allocated to the Medical Department on the basis of square feet. The use of smaller size film, therefore, will decrease the amount of film necessary.

When a patient is transferred, x-ray films should be forwarded promptly as a part of his clinical record in accordance with Army Regulations. This will frequently obviate the necessity for a duplication of x-ray studies at the patient's new hospital.

In such ways, x-ray film can be conserved without impairing the excellence of medical service. Indeed, only through economical use of this critical item can the high standards of Army medical service be maintained. The unnecessary use of x-ray film will so aggravate the shortage that it will not be available when it is really needed.

Personnel of an evacuation hospital board plane for first airborne movement of a hospital in the European Theater. Destination is forward area in Germany. Signal Corps photograph.

COLLECTION OF RODENT SPECIMENS

The present global conflict offers to members of the Medical Department an opportunity to collect specimens of rodents and other mammals which are now known or may at a later date prove to be of medical importance. Epidemiological investigations now in progress will extend our knowledge of the relationships of the natural host mammals, the ectoparasites and the transmissible organisms or viruses that produce diseases of military importance. Consequently, it is highly desirable that rodents and other mammals (including bats) be collected in as many localities as possible so that the geographic distribution of such mammals can be accurately mapped. Such specimens may be of inestimable importance in subsequent epidemiological studies. The rodent and other mammals in many parts of the world are imperfectly known, and it is therefore desirable that properly prepared specimens be collected, plainly marked "Natural history specimen," and shipped to the Director, Army Medical Museum, Washington 25, D. C. Arrangements have been made whereby these specimens will be identified and deposited in the collection of the U. S. National Museum where they can be used subsequently to aid in the identification of other specimens.

For purposes of identification, an adequate series of each kind of mammal is ordinarily required. An adequate series varies somewhat with different kinds of mammals, but in the case of most rodents a series of one to two dozen specimens of each species should be forwarded. Personal collection should not take precedence over the shipment of specimens to the Army Medical Museum as the importance of a complete collection from all parts of the world cannot be overemphasized.

Army Regulation 40-310, dated 31 August 1942, and Change 1 of this regulation, dated 3 July 1944, established the policy for the collection and shipment of specimens to laboratories. War Department Circular No. 277, dated 5 July 1944, "Collection of Specimens, Parasitological, Entomological, Mammalian, and Reptilian," has been published to assist Medical Department officers in the collection of materials in the most efficient manner. To ensure proper preparation and preservation of specimens, copies of "A Field Collector's Manual in Natural History" as prepared by members of the staff of the Smithsonian Institution may be obtained from the St. Louis Medical Supply Depot (Med. Dept. Item No. B205130).

All Medical Department officers are urgently requested to collect and forward specimens whether their importance to health is known or not.

SWIMMING POOL CLEANER

A swimming pool cleaner made by the officer formerly in charge of the pool at Camp Joseph T. Robinson, Arkansas, has been reported by Captain Arvo A. Solander, Sn.C., through the Eighth Service Command Headquarters, Dallas, to The Surgeon General's Office. Figure 1 shows the two G.I. scrub brushes set in the bottom of the cleaner to loosen up particles which have settled to the floor of the swimming pool. These brushes can be bolted to the metal strap and removed when they are worn; the bolts attached to this strap allow the

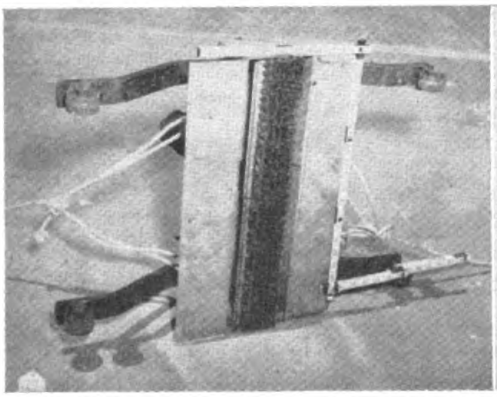


FIGURE 1. Bottom view of swimming pool cleaner.

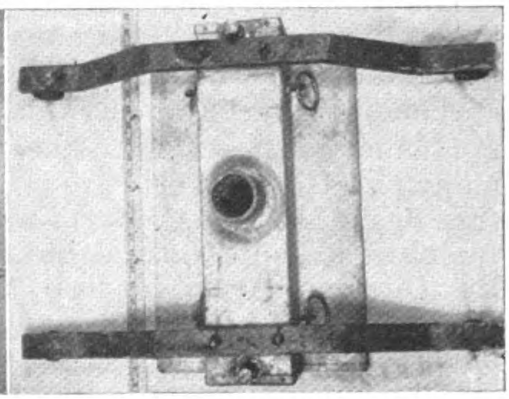


FIGURE 2. Top view of cleaner.

brushes to be moved downward as they wear. Some softening of the bristles occurs after prolonged wetting. On the top of the cleaner (figure 2) is the hose connection to which a 2-inch rubber hose is attached, the other end being attached to a pump. Lead weights placed across the metal straps prevent the cleaner from being pulled off the bottom as it is drawn from side to side by ropes attached to it. This is further pre-

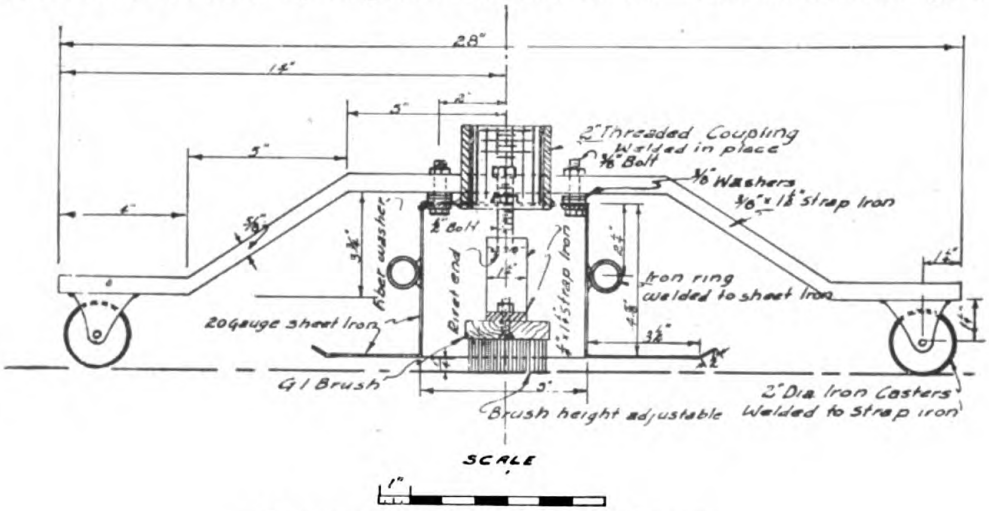


FIGURE 3. Cross section of cleaner.

Signal Corps photographs.

vented by attaching No. 10 cans to the suction hose at appropriate intervals to support its weight. Removal of the settleable solids from the bottom of the pool assures a clear water when the pool is in use. Their removal also aids in the maintenance of bacterial cleanliness when chlorine is added. The cleaner is a valuable aid in maintaining the clarity of water required by the swimming pool standards set up in Circular Letter No. 118, Surgeon General's Office, dated 2 July 1943.

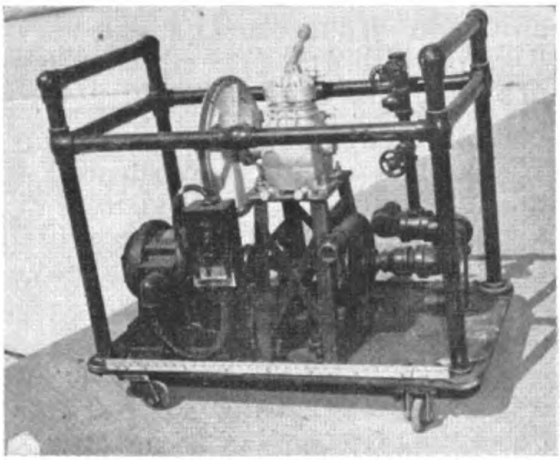


FIGURE 4. Electrically driven centrifugal pump on movable stand.

Further details as to size are shown in the cross-sectional view (figure 3). The galvanized metal used to make up the body of the cleaner is 20-gage; seams were fastened with rivets. For pools with tile bottoms or painted finishes, rubber wheels may be substituted for the steel and thus reduce scratching of the surface.

The cleaner is actually a vacuum sweeper, except that particles are removed by water rather than by air. It can be made at small cost. To pump the necessary water, an electric motor (1.5 horsepower) is directly connected to a centrifugal pump (1.5 inch) and mounted on a portable stand as shown in figure 4. Two-inch suction and discharge hoses are connected to the pump; approximate dimensions of the stand can be scaled from the yardstick. The light-colored mechanism that rests on the steel framework in the center of the stand is a refrigerator compressor connected by belt drive to the drive shaft of the electric motor; this was used when the pool was formerly cleaned by a man equipped with a diving belt and push broom.

SANITARY IMPROVISATIONS

Material is being collected for the publication of a War Department TB MED on sanitary improvisations. For this purpose, it is necessary to have reports from officers who have made or seen these improvisations in the field. The following information is desired: line drawings with dimensions, description of construction methods and materials used, description of operation and capacity, and photographs.

Information on all sanitary improvisations is desirable; however, the following subjects are listed as a guide: (1) water—supply, treatment, showers, heating, and laundries;

(2) human waste disposal—latrines and incinerators; (3) garbage disposal—collection, wash racks, can platforms, incinerators, and sanitary fills; (4) liquid waste disposal—grease traps, soakage pits, and treatment methods; (5) mess sanitation—food storage and serving, and mess kit washing; (6) mosquito and other insect control—drainage, larviciding, spraying, and equipment.

All Medical Department and especially Sanitary Corps officers are urgently requested to forward to the director, Sanitary Engineering Division, Preventive Medicine Service, Surgeon General's Office, complete information on any sanitary improvisation that they have made or with which they are familiar.

CONFERENCE ON SANITARY ENGINEERING

A conference on the sanitary engineering program of service commands was held in The Surgeon General's Office on 9 to 12 April. The purposes of the conference were: correlating the programs and discussing activities of the Sanitary Corps sanitary engineers on duty with the service command surgeons; integrating the activities of the Sanitary Corps with those of the Corps of Engineers; and discussing new developments, equipment, and policies of The Surgeon General's Office in relation to water treatment, sewage treatment, and insect and rodent control.

The conference was opened by Major General Norman T. Kirk, The Surgeon General, and Brig. General James S. Simmons, chief, Preventive Medicine Service, and was attended by Sanitary Corps sanitary engineers on duty in all the service command surgeons' offices. The conference members attended the monthly meeting of the Sanitary Engineering Committee of the National Research Council where the sterilization of water was discussed. A combined meeting was also held with the subcommittee on Sewage Treatment at Military Installations of the N.R.C. at which a progress report of this subcommittee was received. On 11 April the insect and rodent control programs of the various service commands were reviewed. The conference members visited the Engineer Board and the Engineer School at Fort Belvoir, where many items of water supply and insect control equipment were displayed and their operation demonstrated.

CORRECTION

An Introduction to Psychiatric Problems.—In the paper by this title in the April *Bulletin*, page 88, the sentence, "Soldiers with symptoms that have been designated as combat reactions probably belong to the realm of the psychoneuroses," should have followed the word, "disorder," in the sixteenth line from the bottom of the page.

MATTRESS CARRIER WITH HANDGRIPS

Consideration has been given to a method of removing patients from hospitals in case of emergency where it is not feasible to use the standard litter or hospital bed. Several devices have been submitted to The Surgeon General's Office for this purpose. Some have merit and show much ingenuity on the part of the person submitting the idea.

The best of these ideas is the installation of a mattress carrier with handgrips. The mattress carrier is a piece of canvas 6 feet long by 3 feet wide. It is equipped with six handgrips and two longitudinal lightweight web straps. These straps are designed to buckle over the mattress. The handgrips are located near the ends and at the center on each side. They are sufficiently strong to carry a 200-pound patient for 400 yards, and their position provides adequate comfort to the patient during movement. Tests have indicated that the attachment of the handgrips to the canvas will not break while transporting patients. The handgrips are readily accessible and do not cut the bearers' hands. The longitudinal straps extend across the mattress and cause no discomfort to the patient.

The mattress carrier is not a standard item of issue by the Medical Department. The above description is published for the information of those hospitals which have a requirement, in order that the item may be made locally.

COPPER SULFATE PAD FOR WHITE PHOSPHORUS CONTAMINATION

During the use of white phosphorus in this war primarily as a screening smoke, the flaming particles have produced numerous burns on personnel. When such particles hit the soldier, he must extinguish them, whether on clothing or skin, to minimize the damage, and, after the flame is extinguished, the particles should be removed. Any resulting burns should be treated as ordinary thermal burns. The objective of first aid is to extinguish the flame and prevent reignition by depriving the phosphorus of oxygen. Heretofore, the use of water has been the only first-aid measure available to the individual soldier.

To prevent particles from igniting during their removal from clothes and skin, the soldier has been directed to seek the nearest supply of copper sulfate, either in the gas casualty first-aid kit (Med. Dept. Item No. 9776400) or at a medical installation. When treated with copper sulfate solution, a coat of copper phosphide is formed over the phosphorus, excluding air and remaining on the phosphorus indefinitely. The phosphorus particles may then be removed without danger of reignition.

There are disadvantages in this procedure where a soldier

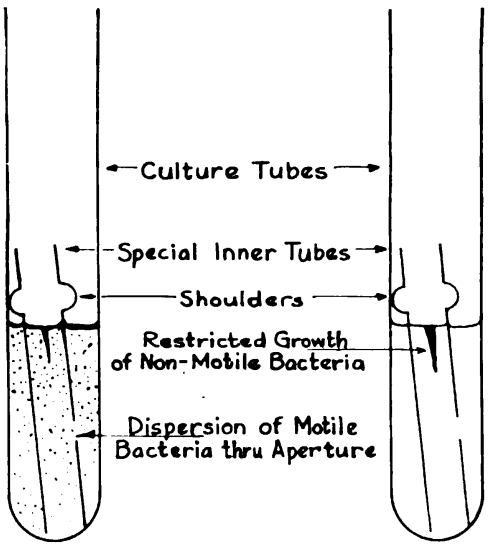
does not have a personal supply of copper sulfate: (1) He may have to leave his position to get copper sulfate solution, (2) he may receive burns from reignition of the phosphorus, and (3) if the contamination is from multiple particles, he may not be able to keep all of them covered with water till he reaches the copper sulfate solution.

To make copper sulfate immediately available to the individual soldier, a copper sulfate pad (Med. Dept. Item No. 9116450) has recently been standardized. This pad is made of terry cloth, 3 by 3 inches, and is impregnated with copper sulfate. Three pads are issued to each soldier in a moisture-proof envelope.

As soon as a man is hit by white phosphorus, he should immediately pour water over the particles. A copper sulfate pad is then wetted with water and placed directly on the contaminating phosphorus. After the flame is extinguished, the phosphorus may be removed when the situation permits, by wiping it off with the pad, or it may be picked out with any instrument at hand.

METHOD FOR ISOLATION OF MOTILE BACTERIA

An apparatus has been devised by Lieut. Colonel Max Levine, Sn.C., A.U.S., and Major Paul W. Preisler, Sn.C., A.U.S., to accomplish the separation of motile from nonmotile bacteria. The apparatus consists of a standard culture tube of any convenient size containing a small tube about 75 mm. long and open at both ends, which is provided with a hole about 3 mm. in diameter in its side at a point about 20 mm. from one end and a 2 to 3 mm. shoulder which encircles the inner tube about 10 mm. from the other end. The shoulder prevents agar from the outer tube passing by capillarity to the rim of, and spreading over into, the inner tube, thereby forming an agar bridge over which bacteria might pass. The small open tube is inserted shoulder end up into the outer tube which is then filled with the culture medium (nutrient broth containing 0.5 percent agar or other suitable semi-solid motility medium) to a point a little below the shoulder of the inner tube, and sterilized (or an appropriate quantity of sterilized medium may be added to a sterile double tube). Inoculation is



made by stabbing into the agar of the inner tube to a point not closer than about 12 to 15 mm. above the hole in its side.

On incubation, growth of the nonmotile bacteria is restricted to the line of inoculation within the inner tube, whereas motile strains migrate down through the medium of the inner tube and pass through the hole in its side into the outer tube where they disperse throughout the medium, from which they can be fished in the routine manner. By adjusting the distance between the point of inoculation and the hole in the side of the inner tube, separation of actively from sluggishly motile strains may be accomplished.

This double-tube technique may be employed for isolation of monophasic from diphasic cultures of the *Salmonella* group by incorporating appropriate antisera into the medium shortly before solidification, as suggested by Hajna,[1] and others.

A POLYGRAPH FOR X-RAY WORK

To construct this device, called a polygraph, requires only a piece of lead 10 by 12 in., and 3/32 to 1/8 in. in thickness, and a pocketknife. A rectangle 5 by 6 in. is cut from one corner of the sheet lead. The resulting L-shaped lead is then glued on a similar piece of masonite. Lead blockers which ordinarily are used in radiography to block off a film allow only two exposures to be made. With the polygraph, four exposures can be made on one film.

While this idea is not new, the polygraph described was designed by Mr. Albert G. Fuller at the A.S.F. Regional Hospital, Ft. George G. Meade, primarily for paranasal sinuses examination. It is now used for several other parts of the anatomy. Paranasal sinuses examination requires four views. Most technicians trained by Army schools are taught to take each view of the sinuses on a separate 8- by 10-inch film (320 square inches). At the regional hospital, they formerly made the four exposures on two 10- by 12-inch films (240 square inches), a saving of 80 square inches on film. Now, using the polygraph, they obtain the same result on one 10- by 12-film and save 200 square inches of film. The wrist, as routinely examined in most laboratories, calls for two views. In this department, by using the polygraph, they obtain four views on the same film. Two other important examinations in which the polygraph can be used are the mastoids and temporomandibular joints. In each case four views are obtained on a 10- by 12-inch film.

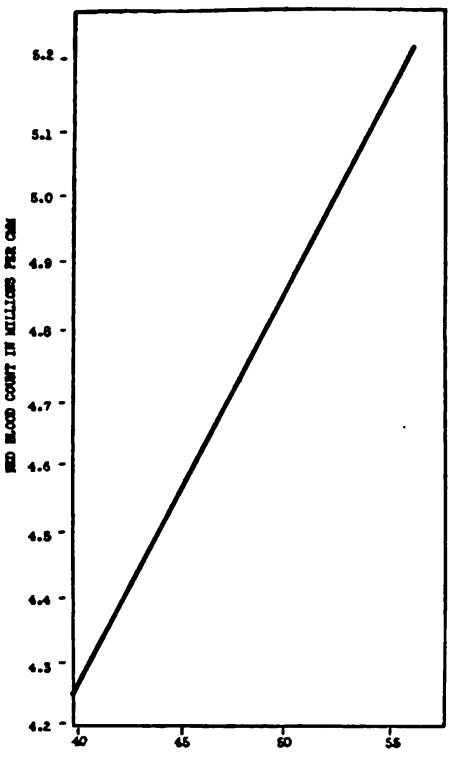
The advantages of this device are saving in film used (40 to 66 percent), less space required in drying cabinets and processing tanks, one hanger required for each case instead of two to four, one film to be handled in processing room, thus

1. Hajna, A. A.: Use of a "U" Tube for the Isolation of Monophasic Varieties of Diphasic Salmonella Cultures, J. Bact., Balt., 48:609-610, Nov. 1944.

reducing work of technicians and resulting wear and tear on intensifying screens, one cassette to be handled by radiographic technician. Most important, in Mr. Fuller's opinion, is the saving to the roentgenologist. This regional hospital averages 3,000 cases a month with two exposures per case, meaning 6,000 that must be closely scrutinized by the roentgenologist. Viewing four radiographs on one film is less eye strain than examining four separate films spread out over almost as many viewing boxes.

ESTIMATION OF NUMBER OF RED BLOOD CELLS FROM HEMATOCRIT

Red blood cell counting is a time-consuming procedure, especially in large Army hospitals where the majority of the patients are young, vigorous males suffering from conditions that usually do not cause anemia, such as fractures and orthopedic conditions. In trying to find a simpler means of screening out those patients who did not have an anemia, the authors made a study of the relationship between red blood cell counts and hematocrit on 3,979 men routinely admitted for various conditions. The red blood cell counts were made in the usual manner, using Thoma pipettes with Hayem's solution as diluting fluid. Hematocrit was then determined on each one, using the Wintrobe technique. They found that it is possible to predict the red blood cell count from the hematocrit. This is particularly true of the hematocrit range of 40 to 52 percent, inclusive, between which one can be quite certain that anemia is not present. It was felt that, when the hematocrit falls below 40 percent or rises above 52 percent, that is an absolute indication for complete hematological work-up when dealing with a male population. Where large numbers of men are to be screened, blood can be drawn into oxalated tubes. The blood can be simply transferred to the hematocrit tubes and, by use of large centrifuge cups, 72 or more hematocrits may be spun down simultaneously.



This linear relationship between the hematocrit and red

Abstract of paper by Captain Alfred M. Freedman, M.C., A.U.S., and Captain I. Arthur Mirsky, M. C., A. U. S., submitted through The Surgeon General's Office to the Journal of Clinical Pathology.

cell count has further significance in relation to Parker's recent method in determining the red cell count in a photoelectric colorimeter by measuring a suspension of red cells. Parker's method is successful because it depends on the linear relationship between hematocrit and red cell count.

MODIFICATION OF ACID-ETHER METHOD OF FECAL EXAMINATION FOR INTESTINAL SCHISTOSOMIASIS

An improved laboratory method of diagnosis of intestinal schistosomiasis was recently devised and tested in the field. Studies at the Antilles Department Medical Laboratory demonstrated that the acid-ether centrifugation technique[1] is efficient for the recovery of eggs of *Schistosoma mansoni* from feces and that it is adaptable to large-scale field investigations.[2] During these studies, it was noted that some schistosome eggs became entrapped in the stratum of floating debris and were, therefore, not recovered in the sediment. This observation suggested that the addition of a detergent to the hydrochloric acid might reduce the adhesive forces in the stratum of debris and thus permit centrifugation of the eggs. The increased efficiency in the recovery of schistosome eggs produced by the incorporation of various detergents or wetting agents into the acid-ether method and their relative efficiency are outlined in table I.

Three acid-ether semiquantitative "control" examinations were performed on each of 24 selected fecal specimens, and schistosome egg counts made. Aliquot portions of each specimen were then examined by the same procedure except that a detergent was added to the acid-feces mixture. The average increased efficiency effected by each of the agents is expressed as the percentage of increased recovery over the number of eggs counted in the "control" examinations.

The floating debris was studied in 25 specimens, each examined with and without Triton NE. It was apparent that this agent markedly reduced the number of eggs of *S. mansoni* retained in the layer of debris and increased the number of eggs recovered from the sediment.

TABLE I

Effect of addition of various detergents on the recovery of schistosome eggs

Detergent*	Average percentage increase
Triton NE	82%
Tergitol 08	50%
Nacconol NR	39%
Duponol C	23%

* 0.6 cc. of a 10 percent aqueous solution was added to the acid-feces mixture.

Five hundred routine fecal specimens were examined by the acid-ether method, with and without addition of Triton NE.

---

1. The Bulletin, June 1945, p. 75.
2. Weller, T. H., and Dammin, G. J.: The Acid-Ether Centrifugation and the Zinc Sulfate Flotation Techniques as Methods for the Recovery of the Ova of Schistosoma mansoni, Am. J. Trop. M. (in press).

It was noted that the number of specimens positive for *S. mansoni,* hookworm, *T. trichiura,* and *A. lumbricoides* was increased when Triton NE was used, though the number of specimens positive for *S. stercoralis* was reduced.

Preliminary studies indicate that the acid-ether centrifugation technique is an efficient method for the recovery of the eggs of *Schistosoma japonicum* as well. Information is not available on the above detergent modification as a method for detection of eggs of *S. japonicum* in the feces; it is suggested, however, that controlled studies on the addition of a detergent in the acid-ether method are worthy of trial by those located where *S. japonicum* is found. Detergents with specifications similar to those used in this study are on the Quartermaster supply list under the designation, "Detergent, mobile laundry," Item No. 51D-175.

PROTECTION OF HEAT PADS FROM MOISTURE

The heat pad, complete (Med. Dept. Item No. 9941000), is filled with a chemical which, when water is added, produces heat and fulfills all the purposes of a hot-water bottle. It occasioned surprise when medical officers in the Southwest Pacific Theater discovered that some pads refused to heat when water was added and that others were almost too hot to handle when removed from their packing cases.

The explanation is simple. In the dank and humid areas of the Southwest Pacific, moisture vapor had penetrated the pads and united with the chemicals inside. The heat-producing properties of some pads had been completely expended; others had been more recently moistened and were uselessly throwing off heat when the packing cases were opened.

Corrective action has been taken. Medical Department depots in the zone of the interior have been instructed to pack all pads and refills in the metal-foil-lined, heat-sealed, paper envelope. All depots are now supplied with the equipment and materials for this type of moistureproof packing, which is also used to protect surgical instruments from corrosion; and it is assured that the pads will be adequately packed. This corrective action will have no effect, of course, on the large number of heat pads in the channels of distribution and in warehouses overseas. It is recommended, therefore, that medical supply officers in all theaters protect this item from excessive moisture, using whatever materials are available.

Army Medical Library.—Mr. Wyllis Eaton Wright of New York City has been appointed librarian of the Army Medical Library, Washington 25, D. C., and Miss M. Ruth MacDonald, of Detroit, chief of the catalog division and head cataloger. Mr. Wright has been associated with the New York Public Library since 1927. Miss MacDonald formerly was head cataloger in the Detroit Public Library.

APPLICATION FOR THE MEDICAL BADGE

Some Medical Department soldiers and a few medical officers who are eligible for the Medical Badge have not applied for the award. According to War Department Circular No. 66, 1945, the badge will be awarded to enlisted men of the Medical Department who are assigned or attached during combat to certain medical detachments. Officers below field grade, except regimental surgeons, are similarly eligible for the award under the conditions enumerated above. It is urged that all qualified personnel apply for the Medical Badge. Unlike the combat infantry badge, there are at present no provisions for additional compensation of personnel entitled to wear the Medical Badge; however, there has been legislation introduced to correct this disparity. Medical officers are urged to have all qualified personnel who have not already received the Medical Badge apply for the award.

INTERPRETATION OF THE COLIFORM TEST

The policy to follow when organisms of the coliform group are found in pasteurized milk was outlined in the October 1943 *Bulletin*, page 81. Recent surveys of Army milk supplies show that, as a rule, a uniform policy is now being followed, which has resulted in less confusion and a better understanding between the Army and those processing milk for the armed forces.

These surveys show, however, a lack of uniformity in the method of conducting the routine laboratory determinations for coliform organisms in milk and in interpreting the results of the tests used. Laboratory determinations should be made in conformity with methods set forth in "Standard Methods for the Examination of Dairy Products." It is generally agreed that properly pasteurized milk should contain not more than one coliform organism per milliliter, unless it happens that a strain of *Esch. coli* capable of surviving the usual pasteurization temperature is encountered.

Because of its simplicity and in view of the fact that the primary consideration is whether or not coliform organisms are present in excessive number, the presumptive test is favored. Furthermore, as we are not particularly interested in actual numbers, it appears that a satisfactory method of conducting this test is to inoculate each of five tubes of lactose broth with 1.0 ml. of the milk to be tested and, if more than two of the five tubes show gas formation, to consider the sample positive for coliform organisms. Where only one or two tubes show gas formation, it may indicate an insignificant contamination.

There is no particular objection to the use of solid media, although it allows a greater opportunity for errors in interpreting the results. Several plates of each sample are necessary to

obtain accurate results, colonies must be adequately identified, and there is always the question of what action should be taken when the plates show two or three colonies.

When the number of organisms is determined, it is believed that the regularity with which the organisms are found in the milk processed by a plant has fully as much significance as the number of organisms found in any one sample. Uniformity of action regarding coliform organisms is desired. Adoption and interpretation of the presumptive test as outlined should give uniform results.

FULL QUOTA OF OCCUPATIONAL THERAPISTS ENROLLED

Occupational therapists' emergency training courses will be terminated as soon as the courses scheduled for June and July have been completed. The courses were initiated last July to overcome a serious shortage of occupational therapists in Army hospitals. The full quota of students has now been enrolled, and no further applications will be considered. Under this emergency training program, 700 college women were enrolled and on completion of their schooling will assist in the reconditioning of Army sick and wounded soldiers. Occupational therapy is regarded as a highly important factor in the Army's program to restore battle-scarred soldiers to the best possible health in the shortest time. Evidence of the success of the program is indicated in the 12,000 soldiers who are being returned to duty each week following participation in reconditioning in Army hospitals.

Feeding stalls in corral for cavalry mounts somewhere in New Caledonia, 1942. Signal Corps photograph.

RIGHTS OF PRISONERS OF WAR

The Geneva Convention of 27 July 1929, relating to the treatment of prisoners of war, contained many important provisions including those that specified the handling of the sick and wounded of armies in the field. The final document as approved by most of the large nations of the world contained thirty-nine articles. In general, the Convention provided that officers and soldiers attached to armies, who are sick and wounded, shall be respected and treated as humanely as possible. A belligerent, when compelled to leave his wounded or sick in the hands of an adversary, shall leave them, so far as military exigencies permit, with a portion of the personnel of his medical service to assist in caring for them. After every engagement, the belligerent who remains in possession of the field of battle shall take measures to protect them from robbery and ill-treatment. Local arrangements, such as an armistice or a cessation of fire, may be arranged to enable the removal of wounded left between lines.

As soon as possible after engagements, belligerents shall mutually forward the names of sick, wounded, and dead taken in charge or discovered by them. The International Office of the Red Cross, Geneva, Switzerland, has made its services available for the transmission of such records. Military authorities may make appeals to the charitable zeal of inhabitants to receive and assist in the care of the sick and wounded of their own and belligerent troops.

Personnel charged exclusively with the removal, transportation, and treatment of sick and wounded, as well as the administration of sanitary formations and establishments, shall be respected and protected. If they fall into the hands of the enemy, they shall not be treated as prisoners of war. Litter bearers, Medical Department soldiers, and other auxiliary attendants of the sick and wounded shall wear distinctive insignia so they can be recognized at a distance, and if captured they are entitled to the same treatment as provided for noncombatant Medical Department personnel. Such personnel may not be detained after they have fallen into the hands of the adversary but shall be sent back to the belligerent to whose services they are attached as soon as the military situation will permit. While waiting to be returned, they shall continue to be assigned preferably to the care of the sick and wounded troops of their own country under the direction of the power in whose custody they are held. On release for repatriation, they may carry with them such effects, instruments, and means of transport as belong to them. Vehicles, airplanes, or ships bearing the distinctive sign of the Red Cross on a white field shall enjoy the protection of the Geneva Convention.

The adherence of the United States and Japan to the treaties of 1929 was reaffirmed in December 1941. The Depart-

From the Personnel Service, Surgeon General's Office.

ment of State sent a telegram to the American Legation at Berne, Switzerland, on 18 December 1941, requesting an expression of the intentions of the Japanese Government with regard to the Treaty of 1929. The Swiss Minister to Tokyo informed the Department of State on 30 January that "Japan is strictly observing Geneva Red Cross Convention as a signatory state. Although not bound by the Convention relative treatment of prisoners of war, Japan will apply *mutatis mutandis* provisions of that Convention to the American prisoners of war in its power." The term *mutatis mutandis* means necessary changes have been made.

[A complete statement of the Red Cross treaties and a brief history of the Red Cross movement, prepared by Colonel Albert G. Love, M.C., appeared in *The Army Medical Bulletin* of May 1942.—Ed.]

MULTIPLE MICRO-TUBE WASHER

A timesaving method has been devised for washing and drying tubes of small diameter, such as are used for hematocrit and icteric index determinations. The apparatus (figure 1) is made from two wide-mouthed bottles of 120-cc. capacity or larger, one (*A*) being cut in two to provide a reservoir for water and cleaning or drying solutions. The two bottles (*A* and *B*) are put together by placing a No. 10 rubber stopper into the mouth of the reservoir half-bottle from the "bottom" and this fits the top of the other bottle. A number of small holes are made at intervals in the rubber stopper through which 1/16-inch copper tubing 6 inches long is inserted (*C*). A piece of glass tubing (*D*) bent to form an **L** is placed through the stopper. This is attached to suction.

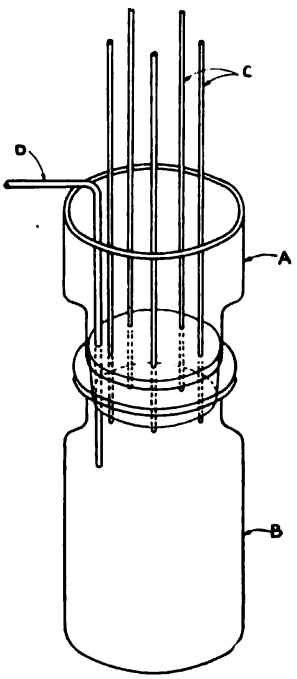


FIGURE 1

The method as reported by Raymond L. Jones and Major Roger D. Reid is as follows: Hematocrit tubes are inverted over each copper tube; water or cleaning material is poured into the reservoir (*A*). Suction draws the cleaning solution and rinse water through the hematocrit tubes with sufficient force to clean them thoroughly. Acetone may then be added to the reservoir to dry the tubes.

"Figures Don't Lie."—War Department Film (TF 8-2101), "Figures Don't Lie," will soon be available from Signal Corps film libraries. The film portrays the WAC exercises as described in FM 35-20 and is designed to be shown to women interested in improving their figures through the use of these exercises. The running time is about twenty minutes.

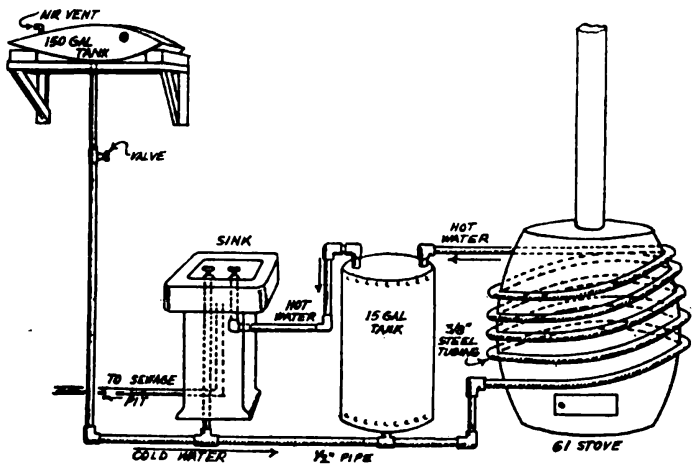
A SYSTEM OF PACKING HOSPITAL EQUIPMENT

A number of hospital units overseas have developed a method of packing which protects supplies and equipment and prevents confusion when the hospital is moved to another area. This is the system employed: All departments of the hospital pack the equipment that is on the wards at the time of the move, adding a two-week supply of expendable items. A large pack is made, consisting of two beds, two mattresses, two mattress covers, two pillows, four pillowcases, six sheets, six blankets, four hand towels, three bath towels, and four pairs of pajamas. All the bedding and linen is wrapped in burlap and placed between the two beds. The entire pack is then bound with metal bands and marked with the hospital department's symbol and with the appropriate number.

As crates and boxes are discharged from freight cars, they are immediately identified and hauled to the proper department of the hospital. This eliminates the confusion that occurs when equipment is concentrated in a central location and then broken down into departments, and makes it possible for the wards to begin operation a few hours after the equipment is unloaded at the new location.

HOT AND COLD RUNNING WATER IN THE FIELD

The necessity for remaining extremely mobile in the Ninth Air Force has brought about many improvised and temporary facilities. The illustration shows the construction of a simple and effective means of providing hot and cold running water primarily in a medical aid station in the field. The material necessary consists of a 150-gallon belly tank or drum, iron pipe, a stove (tent, model 1941), and a fifteen-gallon tank. A sink fixture with faucets completes the picture but is not essential. The belly tank or drum is set up on a ten-foot platform to provide an ample supply of water



Portable Field Hot and Cold Water System

The following personnel are responsible for the construction of this unit: Major Grant Gee, A.C., Staff Sergeant H. M. Ellyne, Sergeant Dale L. Hitchings, Sergeant Adam E. Posluck, Corporal James K. Gore, and Corporal Harry E. Redmon. Reported by Captain Alan R. Bleich, Medical Corps, 392d Fighter Squadron, in the February 1945 Medical Bulletin, E. T. O.

and an effective pressure head. On the top surface of the tank there is a pressure escape opening. The tank may be filled through another opening on its top surface. One pipe leads off from its bottom surface and heads into the tent or building. By means of a T-joint, the cold water is piped to the cold water faucet and also to the bottom of the hot water tank. Another pipe leads from the bottom of the hot water tank to a coil of iron tubing shaped around the outside of the stove, and the other end of the coil leads to the top of the hot water tank; a final piece of tubing leads to the hot water faucet. Waste water from the sink drains into a soakage pit.

The amount of hot water produced depends on the number of coils placed around the stove. Aluminum piping has been demonstrated to be unsatisfactory as a coil.

THE BULLETIN VOLUMES

It has been decided to divide the monthly issues of *The Bulletin of the U. S. Army Medical Department* into two volumes per year, each volume comprising six monthly issues. Volume I of the new *Bulletin,* however, will comprise the first nine monthly issues—that is, from October 1943 to June 1944. The six issues from July to December 1944 will make up Volume II, and the six issues from January to June 1945 will make up Volume III.

In Volume IV, which begins with the present July issue, and in succeeding volumes, the pages will run consecutively throughout each volume.

A wounded American is loaded into a "medic" half-track at Echtz, Germany, for transportation to the rear. 12 December 1944. Signal Corps photograph.

BRIGADIER GENERAL JAMES E. BAYLIS

Brigadier General James E. Baylis, Chief Surgeon of the Burma-India Theater, has been in the Army Medical Department since 1911. He graduated from Mississippi Agricultural and Mechanical College in 1905, Tulane University of Louisiana School of Medicine, New Orleans, in 1910, the Army Medical School in 1912, the Command and General Staff School, Fort Leavenworth in 1927, and from the Army War College in 1931. He has also been awarded a Certificate in Public Health from Harvard University and Massachusetts Institute of Technology. He has served in the Panama Canal Zone, in command of field hospital and ambulance companies, as executive officer of a general hospital, regimental surgeon, corps area surgeon, assistant to the Philippine Department surgeon, in The Surgeon General's Office, as commanding general of the Medical Replacement Training Centers at Camp Joseph T. Robinson, Arkansas, and at Camp Grant, Illinois, commanding general of the A.S.F. T.C. at Fort Lewis, Washington, and as instructor at the Medical Field Service School, Carlisle Barracks, Pa. General Baylis received the Legion of Merit in March 1945.

AWARDS TO VETERINARY OFFICERS

The Bronze Star Medal has been awarded for meritorious service to the following officers of the Veterinary Corps: Colonel Daniel H. Mallan, Lieut. Colonel William E. Jennings, and Captain Milton Horowitz.

PAINTINGS OF ARMY MEDICINE

An exhibit of more than two hundred oil paintings, water colors, and sketches depicting the role of Army medicine in the present war opened in the Corcoran Gallery in Washington on 13 May, and was followed by a reception at a Washington hotel at which The Surgeon General, Major General Norman T. Kirk, and Mrs. Kirk, and Mr. S. DeWitt Clough, president of Abbott Laboratories, and others welcomed hundreds of guests in uniform and civilian dress. On this day, The President and Mrs. Truman received a group of wounded soldiers in the office of the director of the Corcoran Gallery.

The entire collection of pictures, a few of which are shown in miniature on the opposite page, will be exhibited later in several large cities—New York, St. Louis, Seattle, Chicago, Cleveland, San Francisco, and New Orleans. These pictures are the work of artists Howard Baer, Robert Benney, Peter Blume, Franklin Boggs, Francis Criss, John Steuart Curry, Ernest Fiene, Joseph Hirsch, Marion Greenwood, Fred Shane, Lawrence Beall Smith, and Manuel Tolegian, five of whom—Baer, Benney, Boggs, Hirsch, and Smith—were sent on this assignment to the battle fronts in the South Pacific, in Europe, and in the Mediterranean Theater. The other artists did their work in medical installations and in the mills and factories of the drug and surgical industries in the United States. Connoisseurs who have viewed the collection are unanimous in their praise from the standpoint of art, and, in the opinion of many, these paintings are the finest that have come out of this war. The project was sponsored by the Abbott Laboratories, North Chicago, Illinois, and will be known as the Abbott Collection of Paintings of Army Medicine. In his acceptance of these paintings for the War Department, Major General Kirk said:

> "The fact that nearly 97 out of every 100 American soldiers who are wounded and reach hospitals recover from their wounds is ample proof of the important role Army medicine is playing in the war. The American soldier gets better medical care and attention than any soldier of any army in any previous war. His chance for life has been miraculously enhanced by earlier and more skillful surgery, blood plasma, sulfa drugs, penicillin, and unselfish devotion to duty on the part of the Army's heroic doctors, nurses, and enlisted men. That story deserved to be painted. That the artists made the most of their opportunities is apparent from the magnificent paintings they created. These paintings constitute a new and powerful medium for acquainting the public with the work and activities of the Medical Department. I embrace them as a valuable and contemporary history of Army medicine in the war and as a priceless archival treasure."

Top, left to right: *Sunday in Normandy* shows a collecting station digging in near St. Lo, France. *Night Shift.* In the darkness of an Italian night, medics carry a wounded soldier down a rocky slope. *Company in the Parlor.* The walls of an Italian farm house provide shelter for a battalion aid station under fire. *High Visibility Wrap.* A head bandage that leaves two important openings. *Neurosurgery.* A soldier wounded in Europe is being operated on at the Thomas M. England General Hospital, Atlantic City. *The Man Without a Gun.* This medical corpsman stands beside the "salvage pile"—shoes and gear of men no longer in the line.

AWARD OF THE BRONZE STAR MEDAL

The War Department has announced the award of the Bronze Star Medal to the following Medical Department personnel:

CAPTAIN RALPH L. I. PHILLIPS, M.C., of Columbus, Ohio: On 14 March 1944, at Bougainville, Solomon Islands, he crawled through an open area under intense machine-gun fire to give medical aid to several soldiers and a wounded officer. His courage and alert action inspired other members of the patrol, who dispersed the enemy, killing four and taking one prisoner.

SERGEANT GEORGE DAY, of Otisco, Indiana, conducted two litter squads in Italy in 1944 to evacuate wounded to the aid station. One litter was damaged by shell fire and two men seriously wounded. Under heavy artillery, machine-gun, and small-arms fire, he with disregard for his personal safety repaired the litter and evacuated the wounded. His courage and devotion to duty reflect the highest traditions of the American soldier.

TECHNICIAN FOURTH GRADE BLUMER W. BRADSHAW, of Mineral Wells, Texas.

CORPORAL MORGAN PEPPER, of Summersville, Kentucky: In Tunisia in 1943, four members of a mine clearing detail had been seriously wounded by the enemy and were lying in the mine field. He voluntarily entered the mine field, which was still under enemy fire, administered first-aid treatment and removed them. The courage, perseverance, and devotion to duty displayed by him reflect great credit upon himself and his organization, and are highly commendable.

TECHNICIAN FIFTH GRADE JAMES F. STEWART, of North Andover, Massachusetts: For meritorious achievement in connection with military operations against the enemy at Guadalcanal, Solomon Islands, 19-20 November 1942.

PRIVATE FIRST CLASS HAROLD KRISTAL, of Boston, Massachusetts: During action in Italy in 1944 when he was a driver of a ¼-ton medical vehicle, on one particular trip his truck was heavily shelled. He drove forward, attempting to reach a defilade position along the highway, and in attempting to pass another vehicle his truck, loaded with wounded men, became wedged between the bank on the road and the other vehicle. Despite artillery shells which were bursting all around and at the risk of life, he calmly transferred the patients to another vehicle, which had been abandoned by its personnel during the shelling, and brought his patients safely through to the ambulance point. His action was in accord with the highest traditions of the medical service of the armed forces.

PRIVATE FIRST CLASS HERBERT E. MONK, of East Orange, New Jersey: Under heavy, continuous artillery and mortar fire for twenty-two hours during the Italian Campaign, he rendered aid to the wounded, transporting and conducting them through concentrated fire to an aid station. In one instance, learning that the aid station was in need of vehicles to evacuate the wounded, he voluntarily made his way through continuous artillery and mortar fire, over unswept mine fields to the forward battalion command post to transmit a radio request that transportation be sent. His courage under fire and steadfast performance of duty with total disregard for his own safety reflect the finest traditions of the medical service.

PRIVATE HAROLD W. STAMEY, of Lithia Springs, Georgia: As a litter bearer at Bougainville, Solomon Islands, in March 1944, his actions were directly responsible for saving the lives of several wounded soldiers. Carrying the wounded under fire, he treated them with the least possible delay and performed his duty in an exemplary manner.

RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read, and requests for copies, when made, should be directed to the source of the communication through proper channels.

ASF, Headquarters AG SPXMP-M 729.5 (10 Mar. 45) OB-P- SPOPP, 14 Mar. 45	Rodent Survey and Control. Commanders of theaters, defense commands, departments, and base commands requested to submit to Surgeon General a general factual report on rodent problems and control measures. Report to be submitted by 1 June 1945.
ASF, Headquarters Circular No. 104 22 Mar. 1945 Part II, Sect. I	General Hospital. Attention is directed to sect. III, A.S.F. Cir. 375, 1944, which requires each general hospital giving final definitive treatment to sick and wounded Army personnel to enter the type of specialized treatment given each patient on W.D., A.G.O. Form 8-24.
Bulletin of the Judge Advocate General— Vol. IV, No. 2, p. 47 Feb. 45	Retiring Boards. In determining whether an officer's incapacity is the result of an incident of service, an Army retiring board is not bound by a line-of-duty finding made by a service, theater, defense, department, or separate base commander pursuant to par. 1c(4), AR 345-415, 23 Nov. 1933, as amended by C 7, 8 Nov. 1944. However, the board may consider such finding together with other evidence and accord it such weight as the board sees fit upon a consideration of the evidence as a whole (SPJGA 1945/1560, 6 Feb. 1945).
WD Circular No. 91 22 Mar. 45 Sect. I	Hospitalization. Sets forth policies and procedures to carry out reciprocal arrangements between United States and Canada whereby personnel of the U. S. Army may receive medical care in Army, air, and naval hospitals of Canada and Canadian military personnel may receive medical care in U. S. Army hospitals, without cost except for subsistence of officers and for unusual expenses.
WD MEMO 40-45 23 Mar. 45	Travel. Authorizes commanding officers of general and convalescent hospitals and commanding generals, service commands, to issue travel orders for military patients and invited or military attendants in cases involving severely disabled military personnel whose treatment requires temporary duty at their homes, provided (1) travel orders will be issued to provide for patients incapable of caring for themselves; (2) that invitational travel orders be issued whenever practicable for a relative or friend of the patient to accompany patients; (3) that orders for military attendants will be issued only when arrangements have been made for relatives or friends to care for patients while at home.
ASF, Headquarters Circular No. 116 31 Mar. 45 Part III, Sect. III	Military Watches. Directs that any unauthorized issues of military watches be recovered immediately and that necessary action be taken to prevent future issue to any personnel, except those authorized by T/O and E, special lists of equipment, or by specific authority of War Department.
ASF, Headquarters Circular No. 108 26 Mar. 45 Part II, Sect. V	Nursing Service. To supplement nursing service in Army hospitals, assistance of following groups are authorized: civilian nurses, volunteer civilian graduate nurses, senior cadet nurses, WAC medical and surgical technicians, male medical and surgical technicians, volunteer nurses' aides and paid nurses' aides. Sets forth detailed instructions re use of such personnel in Army hospitals.
WD Circular No. 111 7 Apr. 45 Sect. II	Sick Leave. Provides that commanding officers of general and convalescent hospitals (ZI) may grant sick leaves for periods not to exceed ninety days.

GEOMETRIC PROOF FOR FOREIGN BODY LOCALIZATION PROCEDURE

The U. S. Army mobile x-ray table has been designed to provide a rapid fluoroscopic method for the localization of x-ray opaque bodies. While one need not know the geometry involved to determine the position of a bullet or piece of shrapnel in the abdomen, a more intelligent understanding of the procedures is possible when the basic geometry is understood. The following calculation, which is a marked variation and simplification of the analysis which appeared in TM 8-275, was developed in the course of preparation of film strips FS 8-91 and FS 8-92, "Foreign Body Localization," Parts I and II.

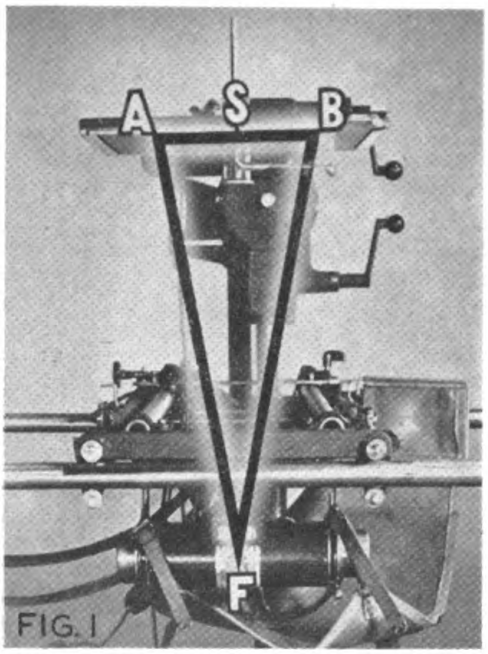


FIG. 1

The proof, provided by Major John W. Page, Jr., Sn.C., is based on the fact that the fluoroscopic screen and the x-ray tube, being rigidly connected by the C-shaped frame, move as a unit. A fixed triangular relationship (△ AFB, figure 1) exists between the two outside reference points of the fluoroscopic screen and the x-ray tube. The analysis establishes the relationship between *the foreign body depth* from the skin surface vertically above it and *the alignment shift of screen and tube* when following the standard roentgenoscopic procedure for foreign body localization.

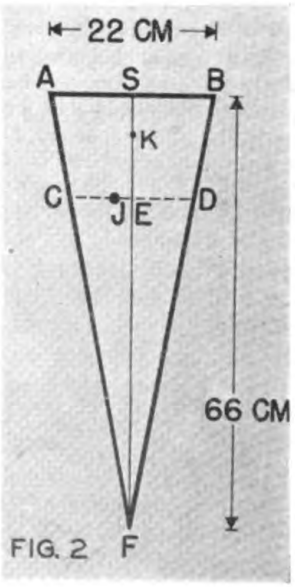


FIG. 2

GIVEN: (see figure 2)

1. Points A and B, the outer crosslines, and S, the middle crosslines, on fluorescent screen. AB = 22 cm., by specifications.
2. Point F, the focal point of tube. FS = 66 cm., by specifications.
3. Triangle AFB is a fixed relationship for all alignments of a foreign body. The altitude of this triangle is three times the base. FS = 3AB, by specifications.
4. Let J be a foreign body anywhere in plane of triangle ABF.
5. E is the position of the foreign body when the tube and screen member is shifted to align foreign body J with S. K is the point on the skin directly above the foreign body when such alignment is

made. Therefore, KS = skin to screen distance, EK = foreign body depth from skin.

6. C and D are positions when screen and tube are shifted to align foreign body with crosslines at A and B respectively. CD is parallel to AB.

TO PROVE:

The vertical distance from skin to foreign body (EK) is equal to three times the difference between the total possible alignment shift (AB = 22 cm.) and the actual alignment shift (CD), less the screen to skin distance (KS). In brief, that EK= 3(22 — CD) — KS.

PROOF:

1.	$\triangle CFD \sim \triangle AFB$	3 sides parallel.
2.	$FS : FE :: AB : CD$	similar triangles.
3.	$66 : FE :: 22 : CD$	substitution.
	$22\,FE = 66\,CD$	transposition.
4.	$\therefore FE = 3CD$	simplification.
5. But,	$FS = FE + ES = 3AB$	given: FS = 66; AB = 22.
6. Subtracting	$FE = 3CD$	step 4.
7.	$ES = 3AB - 3CD$	equals from equals.
8.	$ES = 3(22 - CD)$	substituting 22 for AB.
9. However,	$ES = EK + KS$	the whole = the sum of parts.
10. And	$EK + KS = 3(22 - CD)$	ES = EK + KS.
11. Therefore	$EK = 3(22 - CD) - KS$	
		Q.E.D.

Battalion "medics" carry wounded soldier across a stream on Leyte, Philippine Islands. 27 October 1944. Signal Corps photograph.

Correspondence

EXPRESSION OF APPRECIATION FROM RELEASED BRITISH PRISONERS OF WAR

General Marshall has directed that the following communication from Lieut. General G. N. Macready of the British Joint Staff Mission be brought to the attention of the appropriate officers and enlisted men under the jurisdiction of the Army Service Forces:

"I have just received a cable from our Adjutant General saying that all British prisoners of war recovered in the Philippines have expressed the warmest appreciation of the gallant and well-planned operation by which they were recovered from Cabanatuan and Bilibid. They also speak in glowing terms of the devoted care given to them by American troops after their release, as well as of the excellent administrative and medical arrangements made in the S.W.P.A. and U.S.A. for their homecoming.

"Sir Ronald Adam has asked me to convey to all concerned the deep appreciation and warm thanks of the Army Council.

"I should therefore be most grateful if you could arrange for a message in the above terms to be forwarded through General MacArthur and General Somervell to all those responsible for the execution of the daring operation which resulted in the release of the prisoners, as well as to the administrative and medical officers who looked after the captives so well later on."

WRECKED WATER AND SEWER SYSTEMS

Letter from a Sanitary Corps officer in the Philippines to the Sanitary Engineering Division of The Surgeon General's Office (see June issue of The Bulletin, p. 63).

It was good to hear from you. I'm now in charge of the city water and sewage system and am chief of the Water Supply Section of Operations Division of Luzon Engineer District. I'm very happy in the work. The amount of work to be done on repair of water distributing system is terrific. Even though there aren't many direct hits on the mains, the tremendous amount of shelling on nearby buildings has been enough to make for a generally leaky system. We now have nearly the whole north side in service, but in some places the pressure is weak. We have maintained 40 to 45 lb. downtown for the last two days. We have few sections in service on south side but there must be 80 percent of the area burned and all of the big buildings demolished by mines and shellfire. Have over 500 former employees back in Metropolitan Water District Office and, except for repair of 72-inch concrete aqueduct, they are making all repairs. Yesterday ninety-seven leaks were repaired. We're handicapped by lack of trucks and repair materials—not a single repair for broken hydrants; so we're having to make them, which is a slow process when they have to be turned out on lathe. Japs left little spare parts for anything. The big office and repair shops of the Metropolitan Water District are completely wrecked. Have fairly good supply of all sizes of pipe—no large size valves.

Filter plant will be operating in about six days. After two years of operating without alum, the filters are very dirty. We've washed the first one five times, and it's still not clean. Also have two engineer water supply companies set up, and they operate distribution points where we can't get city water to the area.

Sewage system O.K. except for burned motors at two lift stations which we can easily replace. Outfall to sea has been reported broken and have man out on that today. It's a 72-inch cast iron line laid just below bottom. Will look for new diatomaceous filters. I'll never forget these past two months.

Vol. IV
No. 1

Original Articles

Problems of Disease in the Far East

LIEUT. COLONEL FRANCIS R. DIEUAIDE
Medical Corps, Army of the United States

The course which you have now completed is devoted in good part to tropical medicine. This subject is an important part of the broader field of geographic medicine which we may say is the study, not only of the distribution of diseases, but also of the diseases peculiar to various regions and of the influence of geographic and climatic factors on disease. This great field of study is in its infancy. We must know the distribution of diseases in order to know when we must be prepared to meet them. If we are going to an area that is highly malarious, we must know all we can about malaria. We must not forget that diseases of universal distribution behave differently in different climates, as, for example, do tuberculosis and pneumonia. For the past three years, our Army has been operating well-nigh all over the world. We have had, and will have, great and urgent need, therefore, of medical officers with sound knowledge of this aspect of medicine. As members of this class, you have had the privilege of equipping yourselves for important special duties.

The theaters in which our Army is operating vary tremendously in regard to the special medical problems which they present. In no region are potential problems more varied or more difficult than in the Far East. By this term, we mean the western Pacific, the Philippines, Southeast Asia, China, and Japan. In the Far East, we have all the effects of several varieties of tropical climate in the south and of extremes of heat and cold in northern China and Japan proper. In many parts of the south, the annual rainfall is tremendous. In northern China, the winters are so dry that snow never melts, but evaporates. By no means is all of this great area tropical. The main islands of Japan themselves are not at all tropical.

In this region, there are important instances of diseases which are limited by the distribution of necessary vectors or hosts. There are also many serious diseases formerly of universal distribution, but now rare or unknown in the United States, which are today either common or constant menaces throughout this area. One of the most potent influences on the incidence of disease is the density of the population. Another is the social and economic status of the population. For the

Address before the twenty-third class in tropical medicine on the occasion of its graduation at the Army Medical School, on 3 March 1945.

Army, the closeness of contact, the degree of intermingling, with the civil population is a matter of utmost concern, because, as history eloquently tells us, the diseases of one tend to be communicated to the other.

With justification, we take pride in the health of our individual soldiers and in their protection by immunization against specific diseases; nevertheless, we know that protection cannot be complete and that exposure to dangerous infections will occur, against which there are no available specific prophylactic measures. We have also a scientific and effective sanitary system, the best that any Army has ever had. The maintenance and improvement of this system are the fundamental means of keeping our soldiers in fighting trim.

In the far eastern areas in which our Army is now operating and will in the future operate, population densities are among the highest in the world. Japan proper, with nearly 500 persons to a square mile, is largely one town after another. China contains numerous huge cities, and towns are often but a few miles apart. Tokyo is a city of over seven million persons and Shanghai of nearly four million. The Philippine Islands have about one hundred and forty persons to a square mile, while the continent of Australia has between two and three. Although sanitary conditions in Japan have normally been kept to a surprisingly good standard, the economic level of the nation is low and many of their sanitary arrangements, though effective, are primitive. Generally speaking, sanitation in China and southeastern Asia is thoroughly primitive. In these areas, for the most part, the population will not be able to move away from an invading army. The means of travel are lacking and there just is not room. For many reasons, we can assume that extensive, intimate contacts between our soldiers and civil populations are certain to occur. These conditions are quite different from those which have obtained in the Pacific operations up to the Philippine landings. Before those landings, the Army operated in areas where populations were thin, natives disappeared into the jungle, and contacts were easily controlled. The conditions to be met with from now on resemble those which have been encountered by the very small American force in the India-Burma-China region, where sanitary difficulties have been very great.

It follows from this discussion that, in future far eastern operations, the whole sanitary system of the Army must be brought to the highest possible degree of efficiency and maintained with rigid and unrelenting watchfulness. It should never be forgotten that a degree of flexibility which is safe in the United States or in England may be fatal in the extreme Orient. Minor laxities are not to be indulged in when the cost may be an epidemic of cholera. Army discipline is an excellent tool for the maintenance of sanitation. It should never be neglected.

For various reasons, the incidence of disease in the populations among which the Army operates is a matter of great concern. In many instances, the Army must bring such diseases under control for its own protection. Even if the Army is protected in good measure, for example, against smallpox, typhoid fever, plague, and cholera, it will be necessary for its further protection to control any epidemics of such diseases in the surrounding population. It is also to be noted that the Army has to employ some part of the civil population as labor to help in construction and other noncombatant activities. Civilians so employed must not be a menace to the health of troops. Moreover, in order to work effectively they must have reasonably good health. Indeed, by Presidential direction the Army has the duty of maintaining health among civilians in occupied countries so that unrest will not arise because of disease. It is essential, therefore, that medical officers be informed of health conditions in the civil population in which they find themselves and that, according to the circumstances, they take appropriate and decisive action.

Let us consider briefly some of the special disease problems of the Far East. Of the great scourges, only yellow fever and trypanosomiasis are absent from this region.

Outstanding among the diseases which are profoundly influenced by the density of populations and by the sanitary conditions among them are the intestinal infections. Typhoid fever and all the forms of dysentery are exceedingly common throughout the Far East. In this area is found the home of cholera, from which it frequently spreads until millions suffer. You will need to know thoroughly all the information that has been made available to you about the prevention and treatment of cholera. You will have a unique therapeutic experience if you meet with this disease, for you will be astounded by the huge quantities of fluid and salts which in a few hours are given out by the body and must be replaced and by the remarkable efficacy of that relatively simple measure.

Insect-borne diseases abound in the extreme Orient. Among those which you may encounter are malaria, filariasis, dengue, sandfly fever, and generalized leishmaniasis or kala-azar. You should have at your finger tips the excellent methods which the Army uses for the control of mosquitoes and other insects, for the suppression of disabling attacks of clinical malaria, and for the rapid, effective treatment of soldiers who come down with such attacks. At least four forms of typhus fever occur in the Orient, that is, louse-borne, flea-borne, tick-borne, and mite-borne varieties. Relapsing fever, the historical companion disease of typhus, is found in both louse- and tick-borne forms. It is in the Far East that plague is most at home. There occurred the latest, we dare not say the last, great epidemic of pneumonic plague.

In a miscellaneous group of diseases which you may see in the Orient are leprosy, yaws, and leptospirosis. In one or another part of the region all of these are common. You may be troubled by confusion between leptospirosis and infectious hepatitis presumably of viral origin. This last disease plagues the Army the world over and you should be well acquainted with the results of the extensive studies which have gone forward throughout the war. The fluke infections of the Far East, schistosomiasis, clonorchiasis, and paragonimiasis, are unique and illustrate the biological limitation of disease distribution. We are now going through a trying experience with the far eastern variety of schistosomiasis. These diseases present unusually difficult problems of prevention, diagnosis, and treatment. Because so little is known about them, it is necessary to carry out scientific investigations on the spot, while the war is being fought. Diseases of the skin of one kind or another are common in troops in the Orient. I commend to your attention the numerous cases of virulent diphtheritic infection of the skin which are so frequently overlooked. They are dangerous because of the potential complications and because many of our soldiers are still susceptible to ordinary diphtheria. In regard to skin diseases, abstain scrupulously from all forms of overtreatment. In hardly any field of therapeutics is there equal abuse. Cleanliness, rest, protection from injury, and the blandest applications may astonish you by their efficacy. Because the northern part of the far eastern region is in the temperate zone and has truly cold winters, respiratory diseases of streptococcal and other origin must be expected to be a more serious problem there than they have been in the Pacific areas in which operations so far have proceeded. I should point out to you the great prevalence of venereal diseases in cities and towns of the Orient. In times of peace, the venereal disease rates of our armed forces in certain parts of the East are the worst we have.

It is necessary to stress the dangers of disease in the Far East; however, I would not have you imagine that people in the Orient constantly die like flies of the galaxy of diseases which occur there. It is quite possible to escape and live to a ripe old age. I spent fifteen years in various parts of the Far East without ever having an infection I might not have had in our own country. On a visit to the western Pacific last summer, I was struck by the good health of most of our soldiers. Do not, therefore, regard the prospect of duty in the Orient with apprehension on the score of its long catalogue of diseases. By unfailing proper use of the sanitary and medical principles and procedures at your command, you can maintain a satisfactory state of health and, thereby, a satisfactory noneffective rate, which is your first duty to the Army.

Prevention is the only thoroughly satisfactory means of control of the diseases under discussion. In an Army engaged

in military operations and, especially, in the surrounding civil population, some incidence of disease is inevitable. The early and accurate recognition or diagnosis and the prompt and effective treatment of disease when it occurs are as imperative for a medical officer as for a civil practitioner. In many instances, the practical diagnosis and treatment of diseases in the Orient will be novel experiences. In addition to the special knowledge which you have acquired here of individual diseases, use confidently the background which you have of general principles of diagnosis and treatment. Sound general medical principles apply to exotic diseases as well as to those we are familiar with at home.

As medical officers, you have to practice two professions. You must, in a noncombatant sense, be a soldier. You must, in the highest degree possible, also be a sanitarian and a doctor. The position is one of unusual difficulty and great responsibility. The Medical Department of our Army is proud of the way it measures up to its duties. As individual officers, you have the best preparation and equipment for your duties that can be provided. We know that you will go to new assignments with courage and determination to do your part. You go now to these assignments with the full confidence of your fellow officers and with their best wishes.

Medical Aspects of Amphibious Operations in Pacific Ocean Areas

BRIGADIER GENERAL JOHN M. WILLIS
United States Army
and
LIEUTENANT COLONEL GERALD J. MENAKER
Medical Corps, Army of the United States

Great distances and peculiarities of terrain are problems in amphibious operations which are peculiar to this area, where the objectives have varied from small coral atolls to relatively large land masses. This has affected the usually accepted medical doctrines and has required revision and adjustment for support of these operations. The procedures and methods to be discussed have been adopted, in general, for future operations and mostly have been derived from experience in operations against the Gilbert, Marshall, and Marianas objectives. Coordination between the Army, Navy, and Marine Corps is essential and also influences the medical service in all phases of these operations. Extension of the field of operations into the Eastern World will influence preventive medicine procedures, the composition of medical supporting elements, and preliminary training of all troops. For security reasons, specific places, procedures, and plans are omitted in this discussion.

INTELLIGENCE

In the planning phases, medical intelligence data with reference to terrain, climate, civil population, and epidemiology are collected and disseminated to all participating troops. Information is often relatively scarce, especially with respect to targets which have long been occupied by the Japanese. Intelligence data prepared by joint Army and Navy agencies is made available to the medical planning staff. At the request of the medical staff, special studies are made to obtain specific information regarding future targets. Prisoners of war with medical training and background are interviewed by intelligence personnel with the assistance of Medical Department personnel to ascertain medical problems which may arise in future target areas. Particular attention is given to prevalence of diseases and their vectors, recent epidemics, civil hospitals and public health, sanitation, and sanitary facilities.

PREPARATION OF TROOP BASIS

With the issuance of the preliminary operational plan, the troop basis is formulated for the support of the proposed operation. A study of the troop requirements is made jointly by the expeditionary force commander and Army and Navy agencies. The troops required for both the assault and garrison phases of the operation are decided and base development plans formulated. The task force principle is used in preparing the troop basis for these operations. The factors considered are: (1) composition of the assault and garrison forces—i.e., strength and type of units, (2) mission, (3) objectives, (4) operational plans, (5) medical and sanitary data, and (6) civil population. Certain standard attachments for a reinforced division, which in this theater approximates a strength of 20,000, are one field hospital, two portable surgical hospitals or the equivalent in auxiliary surgical detachments, one malaria control detachment, and one malaria survey detachment. The evacuation hospital, semimobile, has not been available in this theater, nor could it profitably be employed in the short but intense operations against coral atolls such as Kwajalein. The field hospital reinforced by portable surgical hospitals or auxiliary surgical detachments is of value in such operations and lends itself well to the combat team organization of the assault forces. The evacuation hospital, semimobile, should be used one per division in amphibious assaults on the larger land masses, such as Saipan or Guam. The portable surgical hospital is used to support small, isolated landing forces or as surgical teams to reinforce division or separate clearing companies or field hospitals. Although the auxiliary surgical detachment is considered to be a more economical unit for this purpose, the thirty-three enlisted men of the portable surgical hospital are always of value in supporting clearing companies or field hospitals when such units are carrying their maximum patient loads. Divisional clearing companies have been augmented by

additional equipment which in emergency permits their operation as a 250- to 400-bed field hospital. In assaults on large land masses this is not considered desirable, as the increased load decreases the mobility of the clearing company.

SUPPLY AND EQUIPMENT

Planning for medical supply and equipment consists of plans for (1) special supplies and equipment, (2) initial supply of all troops, and (3) resupply. Special combat projects are initiated a minimum of three months prior to mounting the operation, to obtain War Department approval for special items of equipment required over and above T/E allowances. On War Department approval, requisitions are prepared from the Bill of Materials and submitted to the appropriate supply agency. Equipment and supplies are shipped to predetermined mounting points and are assembled for participating units. Thirty days' initial supply to accompany troops is provided for all troops employed. Assault divisions take ten days' supply of essential items only with the battalion landing teams on auxiliary personnel assault shipping, and the remaining twenty days of supply is shipped with the regimental sections on auxiliary cargo assault shipping. All troops landed after assault echelons also carry thirty days' general supply and each hospital ninety days' medical supply. Resupply is automatic in ten- to fifteen-day increments utilizing 6,000- to 10,000-man maintenance blocks. The composition of these blocks is modified after each operational experience and the blocks prepared in mainland depots and shipped direct to the target. Automatic resupply shipments are continued from 120 to 150 days at which time bases are placed on a requisition basis. Requisitions are prepared, at least in part, prior to mounting of the force, so they may be forwarded in sufficient time to assure continued resupply after automatic shipments cease. Special requisitions for urgently needed equipment or supplies are honored at any time by advanced depots established for this purpose.

All detachments, collecting platoons, and shore party sections are equipped with pack equipment. They must land ready to go to work or to move inland without transportation. These packs must be as light as possible. Items not absolutely essential to treat shock or hemorrhage and apply sterile dressings must be left behind. A man with an overloaded pack on his back is helpless in surf. In general, the number of packs to be used by the various detachments are as follows: 14 per infantry battalion medical section, 7 per infantry regimental headquarters section, 7 per field artillery battalion medical section, 7 per shore party medical section, 14 per collecting platoon, 7 per special troops medical section, 7 per engineer battalion medical section.

In setting up clearing companies, field hospitals, and surgical detachments the double problem presents itself in delet-

ing all nonessential equipment to conserve space and tonnage which is limited by the needs for combat materials in amphibious operations, and at the same time build up their capacity to provide bed space ashore should the fortunes of war leave them there without the transports present to receive the sick and wounded. By deleting many bulky items from the field hospital equipment and adding essential items to the clearing company, the clearing platoon and the field hospital hospitalization section closely resemble one another.

At least part of the equipment of the field hospitals and clearing companies is placed on pallets (sleds with runners) 4 by 6 feet and loaded 3 feet high. The entire load is wrapped in waterproofing paper and the joints sealed with tar. It is then fastened to the pallet by 1¼-inch iron strapping. This method of loading the equipment facilitates its handling and prevents the scattering and loss of equipment on beaches. When pulled clear of the sandy beach these can be easily moved wherever desired by a ¾-ton truck or even ¼-ton truck.

Vehicular transportation provided medical installations: (1) Infantry medical section: 1 truck, ¼-ton; 1 trailer, ¼-ton. (2) Collecting companies: 10 ambulances, ¼-ton; 1 truck, ¾-ton; 1 trailer, water, 250 gal. (3) Field artillery medical sections: 1 ambulance, ¼-ton. (4) Clearing platoons: 1 truck, ¾-ton; 1 trailer, water, 250 gal. (5) Field hospitalization sections: 1 truck, ¾-ton; 1 trailer, water, 250 gal.

The ¼-ton ambulance, now the standard for amphibious operations in this area, carries two litters double-deck beside the driver and two sitting cases on the back seat which is turned sidewise behind the driver. The top remains in place and an extra bow holds the rear piece out at an angle covering the rear portion of the litters. The litters easily slide in on channel runners. This vehicle has been used with great success in recent operations. This type of ambulance has many advantages over the standard ambulance, ¾-ton, for amphibious operations. It is easy to transport, takes little room, can be given a high priority loading, comes ashore in any Navy landing craft or a DUKW, and when properly waterproofed can travel through a considerable depth of water and negotiate almost any type of terrain. It gives the casualty a safe, comfortable ride over the badly torn battlefield and is a much less conspicuous target than the larger vehicle. After the early assault phase, however, the standard ¾-ton ambulance is a far superior vehicle.

BASE DEVELOPMENT

Planning for base development consists of housing for hospitals and other medical units, sanitary devices, locations of medical units and establishment of priorities for construction. Standard OCE-type hospitals are provided for fixed hospitals, substituting Quonset or other steel huts for housing in-

stead of the plywood "prefabs" when possible. Initially a limited number of Quonset huts, reefers, and additional generators are provided for hospitals to permit their immediate operation pending construction of semipermanent units. Quonset huts for operative rooms, laboratories, and x-ray and postoperative wards are provided early at the rate of about ten per 1,000 beds. All assault and garrison units bring with them prefabricated knock-down latrine boxes. As a preventive measure and to preclude the contamination of food by flies resulting in intestinal diseases, the preparation of the B ration is not authorized until screened kitchens are available.

All planning must take into consideration the immediate needs of the assault elements and the base to be established as well as the requirements for the support of future operations and bases. Four to 5 percent fixed hospital beds are provided for the average base. However, bases which support future operations and constitute a link in the chain of evacuation are often developed to 8 to 10 percent fixed beds for this purpose. The establishment of advance casualty reception centers at forward bases conserves manpower, since fewer patients are evacuated to the rear areas and to the continental United States.

EVACUATION

The medical service in an amphibious operation is progressive. The extent or completeness as compared to normal land warfare is dependent on the size of the land mass and the degree of enemy opposition. The battalion medical sections and collecting platoons are boated in the first trip of boats and land on call, being ferried over the reef when present by successive trips of the LVT's of which there are usually enough for four waves. In general, the battalion medical section lands in the fifth wave and the collecting platoon in the seventh and eighth waves with at least one of their three ambulances, ¼-ton. The company aid men meanwhile have landed with the assault platoons and are caring for the wounded on the beach. Many of these are immediately evacuated by the LVT ambulance or other LVT's and transferred to small boats beyond the reef. The battalion medical section soon lands and sets up station on the beach where it remains until relieved by the collecting platoon. The station section of the collecting platoon remains on the beach until relieved by the shore party medical section and then displaces inland. Shore party medical sections came ashore in the second trip of boats and when ashore set up near the beach. If casualties are heavy or the period of combat is expected to be prolonged, clearing elements will be brought ashore as soon as sufficient beachhead to provide a suitable site free from small-arms fire has been won. On operations where combat is not likely to be prolonged, all wounded who cannot be immediately returned to duty are evacuated to transports (excepting unwounded neuroses).

Distance between bases requires the use of all available shipping for the evacuation of casualties. The limited number of hospital ships operating in this theater requires that auxiliary personnel assault shipping and other troop transports be staffed by additional medical personnel as they are required for the evacuation of casualties during assault phases and often provide the first definitive treatment. A minimum requirement for hospital ships is two per assault division with one hospital ship for each two follow-up divisions. This would still require the use of assault shipping because of the long turn-around time for these hospital ships in this theater. Air evacuation is used to the maximum. Patients evacuated by air require medical attention enroute, which has been furnished in a superior manner by the medical air evacuation squadrons. Provisions are also made for feeding aboard air evacuation transports because of the great distances.

PREVENTIVE MEDICINE

Penetration into the Eastern World will expose troops to diseases which heretofore were not a threat in this theater. Schistosomiasis has already reduced the efficiency of a group of engineers engaged in constructing bridges across fresh water streams. Malaria, epidemic and endemic typhus, scrub typhus, Japanese encephalitis, dengue, and innumerable gastrointestinal parasites are a few to be considered and steps taken for their prevention.

In the preparation for amphibious operations in this area every effort must be made to anticipate problems of sanitation and health of the command which might arise because of factors of environment, climate, and the necessity for large numbers of troops to be confined to a small area which has just been the field of battle. Sanitation, which is of the utmost importance under these conditions, therefore requires a great deal of preparation and prior planning and education. In the preparation of all units, each of the surgeons is acquainted with the conditions which might prevail and is given all possible assistance in the preparation of his plans.

The following factors must be considered in each of these operations:

1. *Water.* Only water carried as supply by the force is used initially. This water is chlorinated in the containers prior to loading. Small shallow wells are often present in these islands but are never used for drinking or cooking purposes. All water used for drinking or cooking purposes after the initial supply is exhausted is obtained by distillation or from deep wells.

2. *Disposal of waste.* Refuse from rations is quickly buried during the assault phases and later garbage and refuse are taken out by boat or otherwise deposited into the sea.

3. *Latrines.* In the front-line areas, individual excavations are used for defecation. As soon as the situation permits,

straddle-trench latrines must be constructed and flyproof latrine boxes installed. These boxes must be prefabricated and unloaded ready to install. Promiscuous defecation must be avoided since carelessness in this respect invariably leads to dysentery in epidemic proportions. Latrines in this type of terrain must often be built up rather than dug in, because of the high water level, and on coral atolls eventually must be constructed of concrete and emptied periodically by "honey wagons." This to date has been the most satisfactory solution in the coral bases.

4. *Food.* C, K, and D rations are used in the assault phases. B rations are substituted as the situation permits, with first priority in the hospital units. Kitchens must be screened early and adequate mess kit laundry facilities established. Salt tablets are issued to each individual with instructions that two tablets be dissolved in each canteen full of water. Very few cases of heat exhaustion have occurred.

5. *Burial of the dead* is a problem of the utmost importance in the small island bases as decomposition occurs early and each corpse becomes a potential breeding place for flies. Early and proper burial of the dead is the most satisfactory solution for this problem. This is not always possible during the first forty-eight to seventy-two hours of assault operations on small islands because of insufficient service personnel for this duty and also because the entire atoll is in the "front lines." Much work has been done with regard to this problem and fly-breeding in these bodies prevented by the use of sodium arsenite spray.

Preventive measures to be taken are primarily: (1) education and indoctrination of all troops as to the nature, consequences, and preventive measures available; (2) command attention to sanitation, immunization, and other prophylactic measures; (3) supervision of civilian populations; and (4) employment of sanitary companies, malaria control and survey detachments, and trained specialists in preventive medicine, in adequate numbers, on the staffs of all divisions, corps, and armies.

CARE OF CIVILIANS

A disease-ridden, insanitary civilian population is always a threat to the health of our troops. This factor and also the humanitarian aspect requires that civil populations be provided with adequate medical supplies and attention. Previous conceptions as to the requirements for the care of civilians envisioned the employment of civilian medical personnel and facilities to be augmented only by equipment and supplies. To date, experience has proved that little assistance can be expected from civilian practitioners or nurses and that facilities are practically nonexistent after the usual assaults in this theater. To meet the need for the care of civilians the following types of Medical Department units are recommended: (1) Field hospitals, supplemented by additional equipment only,

to care for about 1,000 patients each. The additional equipment and supplies should include those necessary for the care of women and children. (2) Small dispensary sections of the T/O and E 8-500, column GC, type. The dispensary sections should be assigned to assault and follow-up divisions to be available early and relieve divisional medical elements of this added responsibility. Dispensary sections should be left behind to serve "refuge camps" as they are established. Field hospitals should be available to the military government districts section corresponding to local prefectures for use in areas where necessary to reinforce existing civil hospitals. The units can be so organized as to permit their operating as three separated units, each of about 350 beds, which will permit their dispersion to areas where they are needed most.

CONCLUSION

These are some of the outstanding differences and related problems of Medical Department units in this theater. There are many other matters, such as direct shipment of units and supplies from the continental United States to target areas and special training and indoctrination, which must be considered. Future operations and employment of units in the Pacific require prior planning and attention to these matters, especially as the scope and magnitude of these operations are increased.

Scrub Typhus

MAJOR RUSSELL O. SATHER
Medical Corps, Army of the United States
and
CAPTAIN JACK S. SILBERSTEIN
Medical Corps, Army of the United States

This paper deals with the observation and treatment of fourteen cases of scrub typhus. We have been impressed with the clinical variations in this disease as compared with the classical description. The symptoms and clinical findings are protean in nature, making the diagnosis sometimes very difficult. The clinical picture varies with the geographic location. Weil-Felix agglutination tests, with the *Proteus* OXK antigen, have been routine in all cases. When possible, agglutinations with *Proteus* OX 19 and OX 2 have also been determined. Two cases occurred in August, three in September, seven in October, and two in November.

Scrub typhus is prone to occur in restricted areas. Four of our cases occurred in the same company of a single regiment. Two cases appeared in the same company within a period of fifteen days. In the majority of cases, the individual had been clearing debris in the jungle, either prior to or at the time the

clinical symptoms first appeared. In several cases no relation was determined between the occupation and the disease. The length of service in New Guinea varied from one to fourteen months. In no instance had the individual experienced a previous attack. In three cases there was a previous history of malaria.

SYMPTOMS

The incubation period could not be determined, as no patient recalled having been bitten by a mite or similar organism.

Patients were admitted to this hospital usually within one to five days after onset of symptoms. The onset is insidious, with malaise, weakness, fever, frank chills or chilly sensations, and headache. Six cases experienced frank chills. Three patients had chilly sensations but no rigors. Headache and aching in muscles and joints are frequent complaints. The headache is severe and usually localized in the frontal and parietal regions, while the headache in malaria is usually supra-orbital and retro-bulbar. Malaise and weakness are outstanding complaints. The degree of weakness is striking, and unlike malaria, where the patients are usually ambulatory on admission, all of these patients were litter cases. In five cases nausea and vomiting were present early. In one case, general urticaria with severe pruritus was an early symptom. In four cases nonproductive cough was associated with fine rales throughout both lungs. The lung findings were transitory and x-rays of the chest revealed no abnormalities. One patient had a nonspecific diarrhea lasting two days. Epistaxis was present in one patient.

PHYSICAL FINDINGS

These patients present a striking picture when first seen. They are acutely ill with marked weakness and lassitude, and in many instances are apathetic and expressionless. Their general attitude is one of nonconcern.

On admission their temperature usually was from 102° to 104° F., the pulse full and regular, varying between 80 and 110, and blood pressure usually normal.

One patient had a primary lesion, a punched-out ulcer, 1/6-inch in diameter, covered with a black eschar, having indurated margins, and located on the dorsum of the right foot. This patient, who first noticed the ulcer two weeks prior to admission, was not aware of how it began. After repeated examinations by members of our medical service, no other primary lesions were noticed.

Four cases had skin eruptions. In case No. 7, a discrete macular eruption appeared on the abdomen on the third day and disappeared on the eighth day. A scarlatiniform eruption was present on the abdomen at the time of admission (fourth day of illness), in case No. 8. This eruption extended to the anterior chest and disappeared on the seventh day. A maculopapular eruption appeared on the anterior chest, four days after the onset of illness in case No. 11. This eruption gradually extended to the abdomen, upper extremities, palms, and soles, and lasted

five days, gradually fading by the ninth day. A discrete macular eruption appeared over the back on the third day of the disease in case No. 14. The following day this eruption assumed a maculopapular character and extended to the abdomen and ventral aspect of arms and forearms. In no instance was the eruption accompanied by pruritus or burning or other sensory symptoms.

Splenomegaly was present in four patients. In two cases the spleen was palpable on admission, two fingers below the left costal margin. In two cases the spleen was palpable on the ninth and the seventh days, respectively. In all of the above instances the spleen was tender to palpation, firm, and the enlargement persisted throughout the acute stage of the disease. In one case the liver was quite tender and palpable four fingers below the right costal margin. The liver receded to normal size as the patient's condition improved.

Four patients developed either a localized or generalized lymphadenitis. The glands were discretely enlarged and there was no suppuration or drainage to the exterior.

Subconjunctival hemorrhages were present in four cases. The hemorrhagic areas were diffuse and involved both the bulbar and palpebral conjunctivae. Three patients developed a painful pitting edema of both feet. No definite cause could be determined, and the edema disappeared as the patient's condition improved. In one case, the total serum proteins were 5.6 grams per 100 cc. with a normal albumin globulin ratio.

Tracheitis and pharyngitis were present in several cases. Two patients developed a bronchitis with fine scattered rales throughout both lungs. These findings were transitory and x-rays of the chest revealed no abnormal findings. In all except two cases the total white count on admission varied between 4,000 and 7,000. The distribution of polymorphonuclear and mononuclear cells was normal.

Every patient had a remittent fever of 102° to 104° F., lasting from eight to twenty days. The temperature fell by lysis and usually reached a normal level by the thirteenth to the fifteenth day. The fall in temperature was accompanied by a marked clinical improvement.

One patient on the eleventh day developed deafness, which disappeared on the fourteenth day. During their hospital stay these patients became very emaciated, losing from 10 to 25 pounds.

Case No. 1 developed pneumonia in the right lower lobe, confirmed by x-ray. No specific organism was isolated from the sputum. The pneumonia occurred on the twelfth day of the disease and persisted for six days. This patient was acutely ill throughout his hospital stay and on one occasion became cyanotic, developed a rapid, weak pulse and rapid, shallow respirations. After intranasal oxygen and a plasma transfusion were administered, improvement resulted.

Case No. 7 had had malaria at five years of age. On his fifteenth hospital day, a positive blood smear for *Plasmodium vivax* was reported. However, just prior to this period, his temperature had reached a normal level. Exposure, fatigue, and intercurrent infections often precipitate an attack of malaria in a person with a previous history of malaria. The question arises as to whether or not malaria can produce a positive Weil-Felix reaction. We have seen many cases of malaria in which the above test has never been positive. We have never seen a case of malaria in which the OXK agglutination was reported in a diagnostic titer (1:160). In case No. 7, the original OXK was negative and gradually rose over a five-week period to a titer of 1:160. This fact, plus the typical clinical picture, seems to confirm the diagnosis of scrub typhus in this case.

Every patient in this series was investigated from the standpoint of the Weil-Felix agglutination reaction. The laboratory procedures were performed by the Fifth Medical Laboratory. Where possible, agglutinations with *Proteus* OXK, OX 19, and OX 2 antigens were determined. Because of the early evacuation of cases Nos. 1 and 2 to the mainland of Australia, only one or two agglutination tests were performed on these patients. However, the titer obtained in these cases was diagnostic.

Case	Onset of illness	Date of agglutination test
1	1 Aug. 1943	18 Aug., OXK 1:320
2	Not determined	20 Sept., OXK Neg. 27 Sept., OXK 1:1280
3	31 Sept. 1943	25 Sept., OXK Neg. 5 Oct., OXK 1:640 20 Oct., OXK 1:1280 29 Oct., OXK 1:1280
4	31 Sept. 1943	25 Sept., OXK Neg. 3 Oct., OXK 1:2560 13 Oct., OXK 1:2560 25 Oct., OXK 1:2560 1 Nov., OXK 1:5120 ± 1:10, 240
5	27 Sept. 1943	10 Oct., OXK 1:80 20 Oct., OXK 1:2560 29 Oct., OXK 1:5120 ± 1:10, 240
6	2 Oct. 1943	15 Oct., OXK 1:160 24 Oct., OXK 1:640 26 Oct., OXK 1:640
7	1 Oct. 1943	1 Oct., OXK Neg. 15 Oct., OXK 1:40 21 Oct., OXK 1:80 24 Oct., OXK 1:160 27 Oct., OXK 1:160 5 Nov., OXK 1:160
8	5 Oct. 1943	14 Oct., OXK 1:80 21 Oct., OXK 1:320 26 Oct., OXK 1:320
9	8 Oct. 1943	20 Oct., OXK 1:80 25 Oct., OXK 1:160 1 Nov., OXK 1:160 6 Nov., OXK 1:160
10	17 Oct. 1943	25 Oct., OXK 1:160 27 Oct., OXK 1:160 29 Oct., OXK 1:320 1 Nov., OXK 1:640 ± 1:1240 4 Nov., OXK 1:1280 5 Nov., OXK 1:2560 8 Nov., OXK 1:1280 ± 1:2560
11	13 Oct. 1943	19 Oct., OXK Neg. 24 Oct., OXK Neg 26 Oct., OXK 1:80 4 Nov., OXK 1:40 7 Nov., OXK 1:80
12	7 Oct. 1943	14 Oct., OXK Neg 18 Oct., OXK Neg 29 Oct., OXK 1:160 3 Nov., OXK 1:80 ± 1:160
13	20 Nov. 1943	25 Nov., OXK 1:80 ± 1:160 29 Nov., OXK 1:160 1 Dec., OXK 1:80 3 Dec., OXK 1:2560 6 Dec., OXK 1:2560 11 Dec., OXK 1:2560 23 Dec., OXK 1:640
14	24 Nov. 1943	30 Nov., OXK 1:40 5 Dec., OXK 1:40 14 Dec., OXK 1:160 20 Dec., OXK 1:80 10 Dec., OXK 1:40

The Weil-Felix test was performed as soon as scrub typhus was suspected, and further determinations were made at somewhat regular intervals during the acute stage and also during convalescence. As most patients were evacuated to Australia after four to six weeks, it was impossible to investigate further agglutination reactions.

The chart illustrates the results of the Weil-Felix reaction at various stages of the disease.

The Weil-Felix reaction is most significant when the titer rises. A negative report or one of low titer reported early, followed during the course of the disease by a rise in titer, is con-

sidered confirmative of the clinical diagnosis. In some cases the initial OXK was reported as negative and in other cases the original determination was reported in a diagnostic titer.

We consider a titer of 1:160 as diagnostic; however, we believe that an initial negative or low titer, rising to a final level of 1:160, is also diagnostic. Case No. 13 presented few characteristic clinical features but, on the other hand, demonstrated a definite rise in OXK titer to a point of absolute diagnostic value. Case No. 14 presented the most typical clinical picture, and although his OXK reached a diagnostic titer by gradual rise, it never exceeded 1:160.

The *Proteus* OXK agglutination is confirmative evidence when reported as positive in a sufficient titer, but a negative report or series of reports does not rule out scrub typhus.

In some cases the titer reached an extremely high level during convalescence and maintained that level throughout the hospital stay. In other cases, the titer fell when the patient improved.

There is no way to predict at what stage of the illness one may obtain a positive Weil-Felix reaction. However, in most cases a diagnostic titer is reached during the second week. We are of the opinion that routine agglutinations in positive or suspected cases should be determined every third to fifth day.

CASE REPORTS

CASE 13. A 26-year-old white soldier was admitted to this hospital on 21 November 1943. On the previous day, while performing routine duties as a hospital attendant, he became fatigued and very weak. Several hours later he vomited a greenish, mucoid material. Weakness increased and he was confined to bed. On the day of admission he had severe parietal and frontal headaches and for the first time felt feverish. Several weeks previously, the patient had cleared debris around the hospital area. There was no history of a bite by a mite. During his thirteen months in New Guinea, he had always been on suppressive atabrine medication and for six months had been taking 1½ grains of atabrine six days per week. He never had a clinical attack of malaria nor any suggestive symptoms. One year before he had dengue fever. He had had the usual childhood diseases. There was no history of any familial disease.

On admission he was listless, drowsy, expressionless, well oriented, and rational; temperature, 98.8° F.; pulse, 80 and regular; blood pressure 120/78; respiration, normal. He was well developed and well nourished. There were no other positive findings. The red blood count was 4,450,000; total white count, 6,750; hemoglobin, 75 percent; and the differential count normal, with 65 polymorphonuclear and 35 mononuclear cells. The urine was negative.

In the afternoon of the first hospital day, he had a chill lasting thirty minutes, followed by a temperature of 103° F. and a regular pulse of 110. Routine malaria smears were examined every six hours and all reports were negative. Within eight hours the temperature was normal. The following afternoon he had another chill followed by a temperature of 103.4°. Late that evening the temperature again was normal. Following each elevation in temperature the patient experienced diaphoresis.

On the third day he had no chill but his temperature rose to 104.2°. He vomited several times and appeared acutely ill. Because of the history

and clinical picture which resembled malaria, he was given an intravenous infusion of 10 grains quinine dihydrochloride in 1,000 cc. normal saline. There was no response. It was now suspected that this might be an atypical case of scrub typhus and the blood was examined for the Weil-Felix agglutination reaction. The test was reported positive with OXK antigen in a titer of 1:80 ± 1:160. On the sixth day of illness the temperature was 103° F. and remained constantly elevated until the fourteenth day. On the ninth day the OXK was positive, 1:160. On the thirteenth day the OXK was positive in a titer of 1:2,560.

Throughout the febrile period the treatment was symptomatic. The fluid balance was maintained by oral or parenteral administration of 3,500 cc. daily. He was placed on a high caloric diet, enriched with vitamins. When the temperature reached normal on the fourteenth day, there was definite clinical improvement. On the sixteenth and twenty-third days the OXK was again positive in a titer of 1:2,560. The patient regained six of the eleven pounds lost during the acute stage. He was discharged on the thirty-third day and his OXK on this date was positive in a titer of 1:640.

CASE 14. A 30-year-old white male was admitted to hospital on 26 November 1943. Two days previously he developed a sore throat, nasal congestion, malaise, and a nonproductive cough. On 25 November he had chilly sensations, fever, severe parietal and frontal headaches, nausea, but no vomiting. This patient had been in New Guinea four months, during which time he had been on suppressive atabrine medication, 1½ grains daily, six days per week. There was no history of malaria or other tropical diseases. He had had the usual childhood diseases and his family history was negative.

On admission he appeared ill, but rational and well oriented; temperature, 102°; pulse, 88, regular and full; respirations, 20; blood pressure, 100/55. On the dorsum of the right foot was an ulcer 1/6 inch in diameter, covered with a black eschar, margins slightly indurated, and no localized tenderness. This lesion was first noticed two weeks earlier but the patient was unaware of how the ulcer had begun.

The blood count revealed 3,400,000 red blood cells, 9,500 white cells, 72 percent polymorphonuclears, 70 percent hemoglobin. A blood smear was negative for malaria. The urine was negative.

On the day following admission, a discrete macular eruption appeared over the back. The patient complained of bone and joint pains and excruciating headaches. The temperature remained elevated and he sweated profusely. The fluid balance was maintained by 4,000 cc. in twenty-four hours by oral and parenteral administration. On the fourth day, the eruption became maculopapular and extended to the anterior surface of the trunk and the ventral aspects of arms and forearms. The headaches and bone pains persisted. On the fifth day the skin eruption became more prominent and the temperature remained high. The OXK agglutination was reported positive, 1:40. Frequent blood smears for malaria were negative. On the ninth day the temperature reached 104.0° F.; the patient became lethargic and deaf to the degree that he was able to understand only by reading the lips of the speaker. Generalized lymphadenopathy, discrete and slightly tender, was first noted. On the tenth day, he became more lethargic, the skin eruption began to fade, and the temperature reached 103.8° F. Confluent hemorrhages appeared beneath the bulbar and palpebral conjunctivae. On the eleventh day his conditions became critical; pulse, 140, regular and moderately strong; respirations, 40 and very shallow; slight pitting edema in both feet; and fine rales throughout both lungs. The OXK agglutination was again positive, 1:40; the total white count 6,800 with 80 percent polymorphonuclears; blood pressure 100/50. The

patient was given continuous intranasal oxygen and 100 cc. of plasma. The following day the respirations decreased to 26; pulse was 106 and much stronger. The eruption had completely disappeared, the spleen was not palpable, and moist rales were more evident throughout the chest. A portable x-ray was not available and the patient was too ill to be moved. In spite of the chest findings, there was no expectoration. On the thirteenth day the temperature was 99.8°, pulse 100, regular and strong, and the general condition markedly improved. Chest findings were still present but the sputum revealed no specific organisms. On the fourteenth day the temperature reached normal. On the eighteenth day the OXK agglutination was positive, 1:160, while the OX 2 and OX 19 were negative.

The lymphadenopathy gradually disappeared and the ulcer on the foot had healed. By the twentieth day only a small scar remained and the chest findings disappeared. Several small plasma transfusions were given during the critical stage. On the thirtieth day the OXK was positive, 1:80, and on the fortieth day, 1:40. The OX 2 and OX 19 agglutinations were consistently negative. Treatment was entirely supportive. Aspirin and codeine were given for headaches and sedatives for restlessness. The diet during the critical phase was chiefly liquid, rich in calories and vitamins.

TREATMENT

Treatment consists mainly of supportive measures. Good, adequate nursing care is of prime importance. In several instances when patients developed a picture of shock, plasma was given with good results. The plasma was always given in small quantities of 150 to 200 cc. Adequate fluid intake and highly nutritious diet are essential. We did not attempt to use convalescent serum. The important factor is to support the patient during the first thirteen to fifteen days of the disease, after which the temperature usually falls to normal and marked clinical improvement occurs.

Not a death occurred in this series of fourteen cases, which may be attributed to the fact that the disease in this area may be an attenuated form.

After a stay of four to six weeks in this hospital, all patients but one were evacuated to the Australian mainland for further convalescence. This was deemed advisable because of the marked weakness and emaciation which persisted.

DISCUSSION

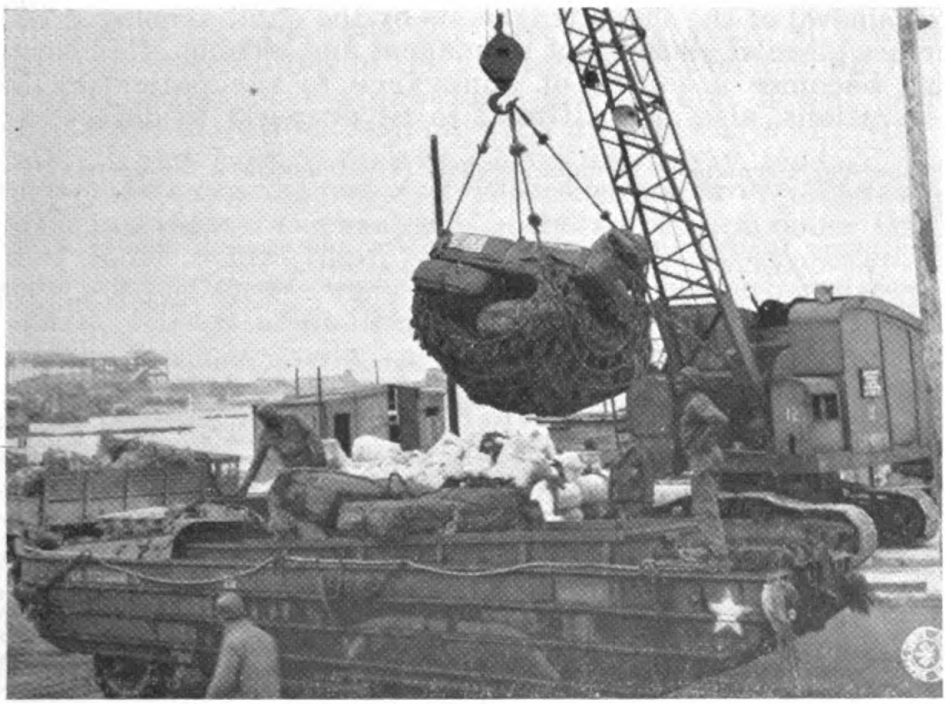
Scrub typhus is an important disease occurring in restricted areas in troops stationed in the Southwest Pacific Theater. The clinical features and laboratory findings are extremely variable. In an area where this disease is known to occur, any patient with a remittent high temperature, weakness, and headache should be suspected of having scrub typhus. Malaria usually can be ruled out by the history and frequent blood smears. Malaria patients, as a rule, do not exhibit the weakness, emaciation, and mental depression which occur in the initial stages of typhus.

A primary lesion is not essential for a diagnosis. Only one of the fourteen patients in this series had a primary lesion. A remittent fever, lasting eight to twenty days, is characteristic and is frequently associated with frank chills or chilly sensations. Splenomegaly and lymphadenopathy are common findings.

A macular or maculopapular skin eruption is occasionally present. It is most prominent on the back, chest, and abdomen, and is not accompanied by any sensory symptoms. The eruption usually appears on the third or fourth day and disappears by the tenth day. Deafness, pedal edema, and bronchitis are occasionally present.

The total white blood count varies between 4,000 and 7,000, with a normal differential. A positive Weil-Felix reaction with the *Proteus* OXK antigen was obtained in all except one case, and in each of these instances it was reported in a diagnostic titer of 1:160. A rising titer is much more significant than a single positive test. The test frequently remains positive during convalescence. A positive agglutination with the OXK antigen is confirmative evidence of scrub typhus, but a negative report does not rule out the disease.

In the treatment of scrub typhus, good nursing care is most essential. The fluid balance must be maintained. Because of the rapid emaciation and weakness, a high caloric diet, enriched with vitamins, is advisable. In the presence of pedal edema or a state of shock, small plasma transfusions were administered with good results. We have been impressed with the value of conservative treatment. Following the acute stage, a prolonged period of convalescence is advocated. We believe that four to six months should elapse before the patient returns to full duty.



Unloading medical supplies from a "duck" in a harbor in France.

Prosthesis of the Eye in Synthetic Resin

A Preliminary Report

CAPTAIN STANLEY F. ERPF
Dental Corps, Army of the United States
MAJOR VICTOR H. DIETZ
Dental Corps, Army of the United States
and
MAJOR MILTON S. WIRTZ
Dental Corps, Army of the United States

Fitting an artificial eye can be readily accomplished by the dental officer in cooperation with the medical officer. A simple, teachable method of fabrication is presented as a result of research conducted by the Medical Department of the U. S. Army, with the object of minimizing the usual period of delay experienced in procuring acceptable prostheses for military patients. Other advantages peculiar to the use of plastic for the fabrication of artificial eyes will be discussed.

CONSIDERATION OF MATERIALS

There are definite disadvantages to the use of glass as a material in restorations of the conventional type. Glass restorations are fragile and are often broken even by the most careful patient. Not infrequently a glass prosthesis will explode spontaneously in the eye socket and will require the painstaking removal of the sharp fragments by the ophthalmologist. The surface glaze of glass is not permanent and etching often occurs. This becomes a source of annoyance to the patient. Glass restorations, also, are difficult to fit properly to defects and

---

See War Department Circular No. 398, 10 October 1944, for partial list of designated U. S. Army general hospitals authorized to supply plastic artificial eyes.

The War Department has announced the award of the Legion of Merit to Major Victor H. Dietz, Major Milton S. Wirtz, and Captain Stanley F. Erpf (with Oak-Leaf Cluster) for work on plastic artificial eyes.

The three citations are practically the same, except that the original work of Major Dietz was done at Thomas M. England General Hospital, Atlantic City, and that of Major Wirtz, at Camp Crowder, Missouri. Because of lack of space, only one is published here.

CAPTAIN STANLEY F. ERPF, D. C.: For services from July 1943 to November 1944. Realizing the advantages that would result through the substitution of plastic for glass in the fabrication and fitting of artificial eyes he, while on duty in the European Theater of Operations, experimented with and produced a plastic eye that proved to be equal, and in certain types superior, to the custom-made glass eye. The resulting improvement in eye prostheses was so marked that other dental officers were immediately trained in the art and the method adopted for use in the theater hospitals. Returning to the United States in the spring of 1944, he was charged with the technical development of the plastic eye program. In cooperation with two other dental officers (Majors Dietz and Wirtz) who had individually experimented along similar lines, at Valley Forge General Hospital from 16 July to 1 November 1944, he perfected the technique, instructed a class of twelve dental officers in its application, and prepared a syllabus for teaching the method. Through his efforts, complete dependence upon a seriously depleted stock of artificial glass eyes no longer exists and superior eye prostheses have resulted.

variations in the soft tissues. All too often for this reason a stock glass artificial eye far too small will be selected for the socket it is intended to fit. Furthermore, the fabrication of an artificial eye in glass requires a degree of artistic talent and skill developed only by years of constant training and experience. Finally, stocks of glass eyes, because of curtailment of imports of critical components, are depleted to the point where military patients are no longer being supplied with restorations which can be considered optimum from a standpoint of fit, color, mobility, and alignment.

Restorations of a more durable substance were urgently required, which could be made as natural or more natural in appearance than those of glass. A material had to be used which could easily be procured and which would lend itself readily enough to routine technical procedures necessitating only the minimum of technical skill and laboratory equipment. A rapid, readily teachable method had to be devised which could be standardized to the point where the component parts of the prosthesis might be prefabricated, then assembled, modified, and adjusted to meet the patient's individual requirements. These requisites were of paramount importance to the military service in the present emergency.

The technique of fabricating plastic artificial eyes described has satisfied the foregoing requirements. Its advantages are concerned principally with the inherent strength of the material used and the ease with which an optimum result may be realized. The method has been kept as simple as possible in order that no extraordinary artistic talent or technical skill would be required. The procedures involved are well within the capabilities of the average dental technician.

The design of the prosthesis is such that it will permit fabrication in custom fashion with little more in the way of material and supply than those found in any modern well-equipped dental laboratory. The advantages of this feature as, for instances, in a theater of operations are obvious. On the other hand, where more elaborate facilities are available, stock production for emergency use may be accomplished, if desired, without difficulty.

The basic synthetic resin, methyl methacrylate, is easily obtained, being a standard item used in the production of acrylic teeth. It lends itself well to molding, coloring, and adjustment of size and shape after initial completion. Synthetic resin satisfies well the three factors important to the success of any prosthesis—namely, function, esthetics, and comfort.

ANATOMICAL FACTORS

Preliminary inspection of the typical anophthalmic socket discloses a conjunctiva-covered posterior wall of more or less triangular outline. The posterior wall is surrounded by cul-de-sacs, or fornices, formed by the reflection of upper and lower lids. The most acute apex of the triangular outline is directed

toward the nasal aspect and resolves itself into the medial canthus. In this region is found a reddish elevation, the lacrimal caruncle. The next most acute apex of the triangle is directed superiorly. Between the two apices mentioned is a broad band, the retracted tendon of the superior oblique muscle which is found occupying the region of the fornix. The least prominent and most rounded apex of the triangle is found in the inferior lateral position.

The contour and motility of the posterior wall of the socket is influenced by several factors depending principally on (1) the type of operation performed by the ophthalmic surgeon—viz., enucleation or evisceration (exenteration), (2) whether or not an implant sphere was imbedded at the time of operation, (3) the type of implant sphere used, (4) the amount of orbital adipose tissue present, which incidentally varies considerably in certain individuals over a given period, and (5) the extent of atrophy of muscle and other tissue incident to the removal of the eye. Contour and tonus of the eyelids are particularly susceptible even to relatively slight injuries. These should be evaluated at the time of the examination of the patient.

With these essentials of anatomic configuration in mind, the technical aspects of the problem may be considered. They are divided for convenience into the following eight steps: the iris disc, the iris button, the impression techniques, the mold, the sclera, the veining technique, the conjunctiva, and polishing and fitting.

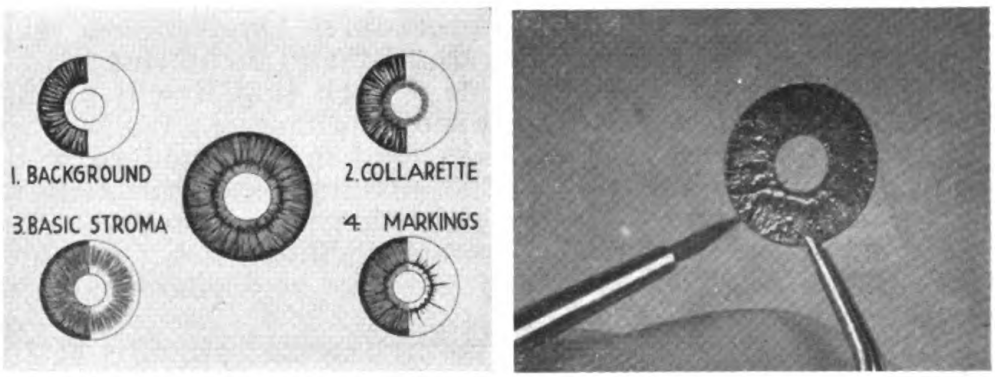


FIGURE 1. The iris disc.

1. *The iris disc.* Clear cellulose acetate, 0.01-inch thickness, is used for the painting of the iris disc. Perforated discs of four external diameters are used. The measurements of these are determined by the frequency range of iris diameters in the human eye—viz., 11.0 mm. to 12.5 mm. Diameters of the central perforation representing the pupillary aperture are varied at will by the operator. They may range from 2 mm. to 7 mm. or larger, the average being 4 mm.

The colors used for painting the iris disc are ordinary artist's oil pigments of high quality. Seven shades have been selected for their color permanency and are as follows: (1) zinc white, (2) ivory black, (3)

chromium green, (4) cobalt blue, (5) burnt umber, (6) yellow ochre, and (7) cadmium red.

Three or four zones of color are discernible in the average iris depending on its over-all color classification—i.e., blue, green, hazel, or brown (figure 1). The first and most peripheral zone of color is that occurring just within the corneoscleral junction. For identification it will be called the "background color." For practical purposes, it is the key to blending of the paints for subsequent procedures.

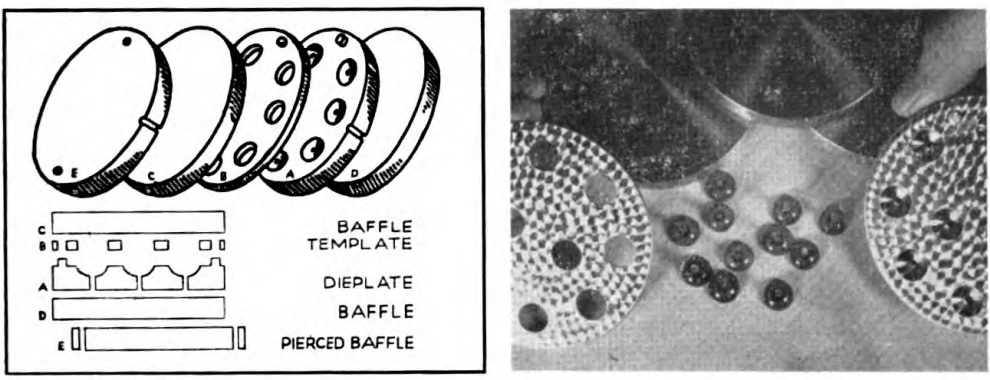


FIGURE 2. The die set.

The second zone of color occupies about one-half the radius of the disc and is found just within the zone background color described. It is a lighter color and can be usually matched by the simple addition of zinc white to the background color, the one exception to this rule being in the case of brown eyes when it is advisable to lighten by the addition of yellow. For identification it is referred to as the "stroma color" since its structure is radiating and striated in nature. The third zone of color is the "collarette color" which, with the exception of brown and hazel eyes, is found just within the stroma color. It can be matched with the addition of brown to the stroma color. Its radiating fibers are of considerably more delicate design. The fourth zone comprises that of the markings and assumes a variety of shades ranging from lemon-yellow to brown. Its designs, as in blue and green eyes, vary from small specks to a flame-shaped overlay covering half or more of the iris as in the case of brown or hazel eyes.

The paints are applied on both sides of tne transparent iris disc, in such a manner that the background and collarette colors painted on the underside will be discernible through the striations of the stroma color and markings painted on the obverse. This feature produces a true third-dimensional effect in the subsequent processing. Softness or harshness of striations is controlled by varying the consistency of the paint with linseed oil. After painting, the discs are placed for drying on a suitable rack (the small aluminum trays in which porcelain teeth are carded are excellent for this purpose). Drying is effected in a drying oven. Several hours at a temperature of not more than 55° C. are sufficient, provided that the paints have not been applied too thickly. Curing at higher temperatures will result in disc shrinkage.

2. *The iris button.* The die set for the processing of the iris button consists of five parts, namely: (a) die-plate, (b) template, (c and d) two baffles, (e) pierced baffle (figure 2). These are constructed of stainless steel and contain sectional cavities of varying sizes which permit the molding of the iris buttons. The iris button comprises four essential features—

viz., the iris disc, the pupil disc which is immediately behind the iris disc, the clear portion representing the anterior chamber and cornea, and the button stem. The advantages of the button stem are: (1) to act as an ejector-pin for removal of the button from the mold; (2) to act as a handle-pin for convenience in manipulating the wax form; (3) to serve as a device in determining correct alignment of the visual axis; (4) to serve as a locator for the button during molding and processing of the sclera.

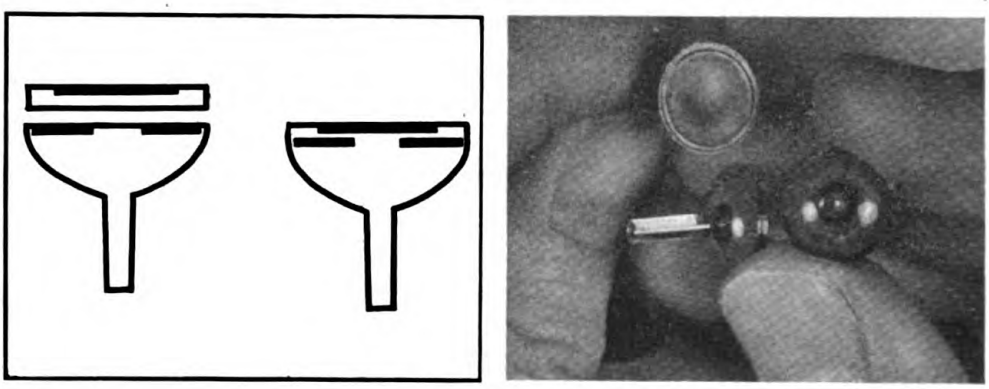


FIGURE 3. The iris button.

The advantages of the button *per se* are obvious in that prefabrication of an essential part is possible. The button can be made ready for immediate selection and use in the wax form on presentation of the patient. In spite of its simplicity it embodies such important features as the following: (1) A predetermined average corneal curvature and depth of anterior chamber which can be subsequently adjusted to meet individual requirements. (2) A means of producing the all-important diffused junction between the cornea and sclera and the opportunity of adjusting it to meet individual requirements. (3) A means of accurately selecting an iris of proper size and color without making allowance for the magnifying and intensifying effect of a subsequently placed clear plastic overlay.

Packing the die-plates: The die-plates are packed with a mixture of clear resin dough of rubbery consistency. The various essential elements of the die-plate are separated by intervening layers of dry cellophane to permit test-packing. All excess plastic is eliminated by test-packing and the flash material is removed by means of a suitable instrument. A jet black vinyl acetate pupil disc and the painted iris disc are then inserted in two stages and the die-plates reassembled and placed in a spring compress. After remaining under spring pressure for at least twenty minutes the press is tightened completely and the button allowed to cure in dry heat at 76° C. for at least three hours. After curing, the die is cooled and the buttons removed. It should be noted that the black pupil disc lies some distance posterior to the iris disc. This feature still further enhances the third-dimensional effect (figure 3).

3. *Impression techniques.* Stock artificial eyes when placed into sockets oblige the orbital tissues to conform to the prosthesis. Carefully made scleral forms individualized to the particular requirements of a given case reduce the possibility of distorting the tissues of the socket. If this factor is not observed, the maximum degree of mobility, so greatly desired in the artificial eye, is frequently lost.

An artificial eye with an ill-conforming periphery often causes the tissues and the fornices of the socket to be stretched into abnormal positions, thereby causing circumferential resorption and limiting mobility. Stock artificial eyes which are too loosely fitted lack adequate retention

and frequently will lag when the various ocular excursions are initiated. Such eyes produce their most notorious sequelae in the nature of shrinkage of the sockets with accompanying flaccidity of the orbicularis muscle and the orbital tissues. In either of the aforementioned cases the conventional concavity of the posterior surface of the stock eye may cause the prosthesis to teeter-totter over the fulcrum-like convexity produced by the implant-sphere. Noncontactual posterior surfaces may also impose an excessive stress upon the tissue-bearing areas of the periphery. The so-called "inevitable tissue changes" within the socket are frequently precipitated by those artificial eyes which are not physiologically and anatomically correct.

To our present knowledge the impression for the artificial eye should be taken within two or three weeks after the enucleation, as dictated by postoperative resolution. It is, of course, assumed that a plastic, modeling compound, or gutta-percha conformer will have been employed for a more effective centering of the implant-sphere in the socket during the interim between surgery and the taking of the impression.

Two alternate impression techniques are employed in developing a wax form which will determine the size and shape of the scleral portion of the artificial eye. The first, simpler, and more rapid of these is a "compression-impression technique" which is indicated in all cases where the socket to be fitted is not of grossly abnormal configuration, such as might be caused by cicatrices, extensive loss of contents of the socket, or injury to the structures of the eyelids. The second method is termed the "injection-impression technique." It is more circuitous in nature, and produces a no more effectively shaped prosthesis for the uncomplicated socket. It is advantageous, however, in those cases of extreme irregularity where retention of an adequate prosthesis constitutes a problem. The injection-impression technique is not recommended in the following instances: (1) In atony or flaccidity of the inferior lid. (2) In extremely small sockets, until peripheral distension has been adequately established in order to effect a retentive depth in both the superior and inferior fornices. Peripheral distension should be developed by the use of conformers of increasing size over a suitable period of time. (3) Where it is desired to employ a light-weight or shell-type prosthesis to minimize the weight factor which frequently causes sagging of the lower lid.

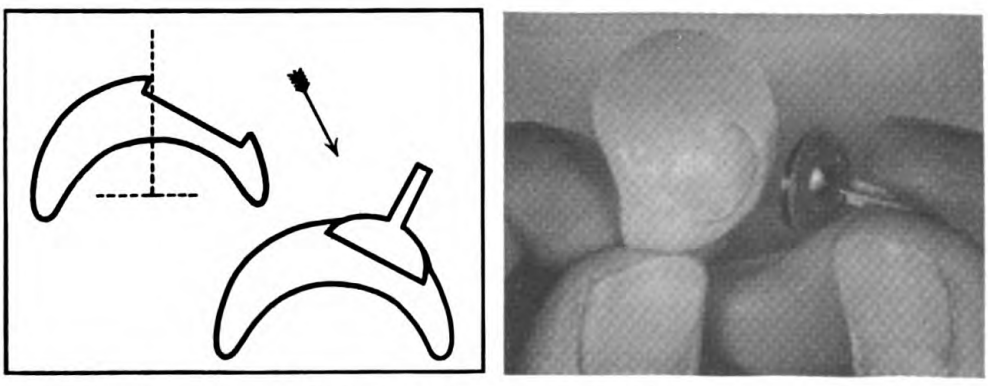


FIGURE 4. The wax pattern.

The compression-impression technique is as follows: A shallow cup is formed in medium hard paraffin wax, the convex surface of which should approximate that of the anterior aspect of the sclera of the eye to be duplicated. In most instances, this will be found to resemble closely

the curvature of a one-inch sphere, slightly compressed in vertical dimension, and slightly expanded horizontally. The wax cup is trimmed on its periphery to conform to the triangular outline of the posterior wall of the socket mentioned above under "Anatomical Factors." It should be observed that the edges of the prosthesis accommodated by the inferior and nasal fornices are of lesser thickness than those accommodated by the superior and temporal fornices. It is extremely important to relieve adequately the wax to compensate for the tendon of the superior oblique muscle which is found in the superior nasal position. Failure to observe this cardinal point will result in limited motion of the prosthesis in all directions, will result in tendency of the prosthesis to rotate in its socket, and will cause a sagging of the lower lid due to compensatory pressure. The posterior surface of the prosthesis is made concave, keeping in mind that too great a concavity will result in the production of a reservoir for socket secretions, and too little will result in limitation of movement. Ideally, the posterior wall of the socket should barely make contact with the prosthesis in this area. Experience has shown that optimum mobility is produced as a result. Additional relief to accommodate implant-spheres, if present, should also be made at this time.

When the wax pattern has been trimmed to the shape and size determined by observation of the landmarks mentioned, it may be tried in the socket. Being moldable at body temperature, the wax will partially conform itself *in situ*. Carving and finger-shaping, controlled by chilling of the wax in cold water, will assist in this connection. The center of the iris may then be marked in the wax with a suitable instrument. On removal, a circular recess (figure 4) is cut into the wax at the position marked for the reception of the iris button. The iris button is then seared in place. The wax pattern is tried again in the socket and such corrections are made as may be necessary to bring the iris into final position and alignment. Accommodation for the caruncle is also made so as not to suppress secretions from the lacrimal gland. Attention is then further directed toward refinement of the anatomical features already enumerated. A final check of alignment and mobility completes the compression-impression technique. It is obvious that universally-shaped blanks of wax, pre-molded with recess, and placed in stock ready for reception of the iris button and refinement of fitting, can be employed to facilitate this step of the procedure.

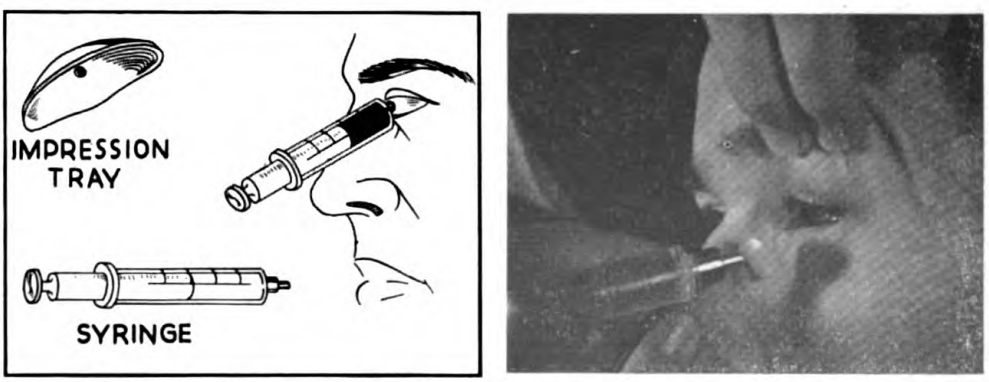


FIGURE 5. The injection impression.

The injection-impression is as follows: Alginate impression material is mixed of somewhat thinner consistency than that used for dental impression taking. The material is spatulated for approximately one minute;

the temperature of water used is preferably 70° to 80° F. Five cc. of the material placed within the syringe is sufficient for the socket of average size. The B-D Yale-lock type of Luer syringe (5 cc.) with the hub-lock removed is especially convenient to use.

With the patient looking straight ahead in distant vision, the hub of the syringe is placed within the palpebral fissure and the material is injected into the socket (figure 5). For convenience, a curved perforated impression tray of wax or plastic placed over the nozzle of the syringe may be used to establish normal contour to the upper and lower lids. Before the impression material has completely set, the syringe is withdrawn and after three minutes the impression is removed. It is immediately placed in the fixing solution which accompanies the alginate material. After remaining in this solution for at least fifteen minutes it is invested in stone as described below in the section on "The Molds."

From this mold a basic wax form must then be made which is altered in conformity with individual requirements. It must be remembered, however, since the injection-impression technique is the method of preference for use in malformed and mutilated sockets, that the anatomical landmarks described may be lost or obscured by the registration of various deformities. Attempt is made, of course, to produce a prosthesis of average shape, but frequently compromises must be made and one feature played against another, in order to accomplish an acceptable result. Herein lies the principal value of the method just described in that it copies perfectly such irregularities as must be dealt with in producing the optimum form for the deformed socket.

4. *The mold.* Artifical stone is recommended to give the mold the necessary hardness. The wax model should be flasked with its posterior surface toward the base. Care should be taken to avoid undercuts.

The stem of the button is then covered with petrolatum and the upper half of the flask is poured. After separation and removal of the wax, the iris button is carefully lifted out and the entire mold is tin-foiled. The iris button is then replaced and the mold is ready for packing of the sclera plastic. After packing, the sclera plastic is cured in either boiling water for one hour or in dry heat at 76° C. for three hours.

Should the injection-impression technique be used, it is necessary to form a wax pattern from a similar mold, omitting, of course, the extra steps involving the iris button. From this point on, the two techniques are identical. The wax is tailored by trial in the socket and the iris button imbedded.

5. *The sclera.* The colors of the sclera are manifold. Zinc oxide and titanium dioxide are most desirable opacifying agents and function, no less importantly, as whitening agents. The delicate grayish appearance of the sclera is affected by a balanced combination of zinc oxide and ivory-black powder pigment on the polymer granules.

The basic scleral shade is modified by the addition of minute amounts of pigment which function very subtly. The powder colors used for this purpose are five in number: brown, yellow, green, blue, and gray. With these, by formula, a scleral shade guide is composed of the shades mentioned. Various combinations may be produced by cross-blending or dilution with additions of the basic unpigmented shade. The correct scleral shade is selected by comparison with the actual basic color of the sclera as seen superior and inferior to the iris. Experience has shown that the most nearly universal shade is a combination of the green and yellow mixtures.

Assuming now, that the scleral portion has been processed around the iris button, the stem is removed and the anterior surface only of the

prosthesis is polished with pumice taking particular care to establish a proper corneoscleral junction, or limbus. If it should be desired to increase the apparent diameter of the iris or to decrease the depth of the anterior chamber, the limbus is polished back a little. More of the limbus is allowed to remain toward the medial canthus in order slightly to decenter the pupil in that direction, which is anatomically correct. The posterior surface of the prosthesis is allowed to remain unpolished in order that it may be relocated in the mold for processing of the conjunctiva. The restoration is now ready for the application of the veins.

6. *The veining technique.* For this purpose red rayon threads are employed. Having selected the proper color, a small sample of the fiber is separated into its monofils. By directly observing the degree of veining we follow the pattern of the veins as to their number and various diameters. The diameter of a single vein is increased by running two or more monofils together. Very realistic venous ramifications may be attained by adroit application. An alcohol-chloroform solution is used to tack the fibers into their different designs—i.e., straight, tortuous, sinuous, or any combination thereof (figure 6). The veins with which we are particularly concerned arise, essentially, from the direction of the medial and lateral canthi and terminate on reaching the limbus or before. Interrupted venous courses may be effected by breaking the continuity of the veins by cutting them in short lengths. In order to effect the structureless and delicate capillary beds red oil pigment may be delicately and sparingly applied. Similarly, oil colors of brown or yellow are applied by the finger tip in order to produce the characteristic surface pigmentations towards the medial and lateral canthi. A slight reddish tinge is also produced at the nasal aspect where occasionally this margin is visible during extreme lateral excursions. It is now ready for the application of the clear layer which is comparable to the conjunctiva.

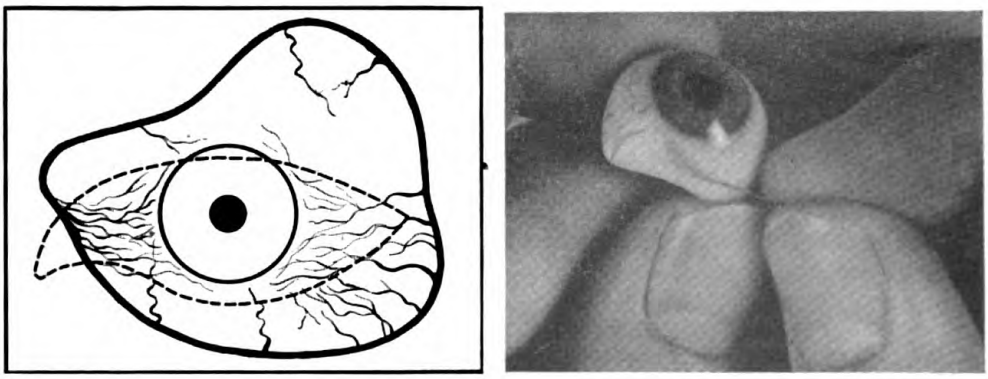


FIGURE 6. The blood vessels of the sclera.

7. *The conjunctiva.* The button stem which was deliberately removed during polishing of the sclera is reinserted into its proper position in the original mold. The mold is then re-tin-foiled. With the prosthesis now in position in the posterior half of the mold, a mixture of clear plastic dough is made and thinned out to wafer thickness. When its surfaces are no longer tacky to the touch, it is placed over the anterior surface of the prosthesis and the flask is then closed with spring pressure. Test-packing is seldom necessary. The case is cured at the usual temperature. Application of the clear plastic overlay representing the conjunctiva in this step must be carried forth carefully. The use of heavy closing pressure, or of resin dough which is not of proper consistency, may result in scrubbing off the applied veins and surface pigments or may craze the clear plastic

of the iris button. A monomer-polymer mixture has also been used successfully as a dipping solution to develop the overlay of plastic representing the conjunctiva.

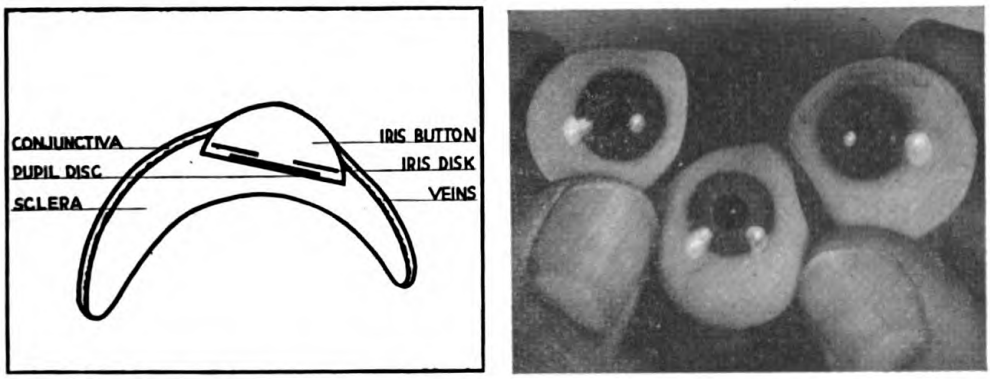


FIGURE 7. The finished prosthesis.

8. *Polishing and fitting.* Final polishing is effected with arbor chucks, pumice, tripoli, and polishing wax (figure 7). The prosthesis if carefully made will require only minor adjustment on insertion. Attention should be directed toward relief of possible impingement on the caruncle, toward obtaining proper alignment, and for producing contours on the corneal portion which must reflect high lights of identical number, size, and position with respect to the pupillary aperture when compared to the eye of the opposite side. This latter is extremely important, and the cosmetic success of the restoration greatly depends on it. Fine adjustment of peripheral contour should be carried out only after the patient has worn the eye for at least several hours, since some time is required for final equilibrium of tissues to be established after reception of the restoration.

Insertion is made with a drop of mineral oil and final instructions to the patient as the proper care of the prosthesis and the eye socket (see figure 8). It has been noted that many patients will wear prostheses for several weeks or months at a time without removal. Such well-fitted restorations when removed for inspection reveal sockets that are clean and with good tissue tonus. Although this practice is not recommended, it is felt that it speaks well for factors of comfort and compatibility of acrylic resin in contact with tissue over long periods.

FIGURE 8. Patient before and after delivery of prosthesis, Dibble General Hospital.

The technique described is not to be considered in its final form at this time, as there are several aspects of this work yet to be investigated. These are principally concerned with still further reconciling custom-built features with those of standardization, so that fabrication may be facilitated without sacrificing the advantage of meeting the individual requirements of every patient no matter how complicated the problem.

SUMMARY

The technique described for fabricating a plastic artificial eye embodies the following advantages: (1) Freedom from fragility and surface etching occurring as a result of dissolution by socket secretions. (2) Adjustability of size and form during and following fabrication in order to compensate for socket irregularity so frequently observed in cases of military nature. (3) Adaptability of various other features, such as the limbus, depth of anterior chamber, diameter of iris, pupillary aperture, vascularity, and sclera color, to meet individual esthetic requirements. This is possibly only because of strictly anatomical assembly of parts throughout. (4) An actual three-dimensional effect in iris construction due to suspension in clear resin of a perforated transparent disc which has been painted on both sides. The three-dimensional effect mentioned is further enhanced by placement of the pupil disc at some distance posterior to the iris disc. (5) Opportunity to stock prefabricated iris buttons enabling the operator to know at the outset the exact color of the iris in the completed prosthesis. (6) Elimination of such time-consuming steps as multiple-mold construction, precision grinding of the iris recess, and engraving for simulation of veins as required in plastic prostheses of the conventional type. (7) Teachability of method insofar as dental personnel may be trained to undertake all phases of fabrication after a relatively short period of instruction.

Seminars at the Army Institute of Pathology.—The following subjects were discussed at the weekly seminars at the Army Institute of Pathology, Washington, D. C.: "A Comparative Study of the Pathology of Scrub Typhus and Other Rickettsial Diseases," by Major Arthur C. Allen, M.C., 28 April 1945; "The Pathology of Trench Foot," by Captain N. B. Friedman, M.C., 5 May; "Experimental and Therapeutic Observations with Penicillin-Beeswax-Peanut Oil," by Captain Monroe J. Romansky, M.C., 12 May; and "The Similarity of Civil and War Injuries," by Dr. Harrison S. Martland, professor of forensic medicine, New York University College of Medicine, 19 May.

Monthly Medical Meeting.—Major General Norman T. Kirk, The Surgeon General, presided at the regular monthly meeting of medical officers at the Army Medical Center, Washington, D. C., on 17 May. Brigadier General Charles R. Glenn presented additional opening remarks. Colonel John C. Flanagan discussed "Experimental Evaluation of Aircrew Selection Procedures"; Lieut. Colonel A. P. Gagge, "Human Factors and Aircraft Design"; and Colonel Russell V. Lee, "Use of DDT by the Air Corps."

Vol. IV
No. 1

Treatment of Diphtheria Carriers with Penicillin

CAPTAIN B. B. BERMAN
Medical Corps, Army of the United States
and
LIEUT. COLONEL S. H. SPITZ
Medical Corps, Army of the United States

Any carrier of a virulent, disease-producing organism is an important problem among military personnel where troops tend to live in close association with one another. The carriers of *Corynebacterium diphtheriae* are particularly dangerous. Schick-testing of troops has shown that about 30 percent of the personnel are susceptible to diphtheria. Furthermore, the carrier problem in diphtheria, generally conceded to be 15 percent in any epidemic, increases the noneffective rate through the necessity of long periods of hospitalization or rigid quarantine.

The problem of diphtheria carrier states has been recognized for years, but no rapid method of treatment has produced favorable results. With the advent of the sulfonamides, it was thought that a successful approach to this problem would be found, but these antibiologics have proved unreliable. In-vitro experiments, by Fleming and others,[1] [2] [3] [4] have demonstrated the definite bacteriostatic influences of penicillin on the *C. diphtheriae*. In-vivo experiments have not, as yet, been been reported.

This report describes the use of penicillin applied locally to the nose and throat of a group of diphtheria carriers in an attempt to revert them quickly to a noncarrier status. A patient was not considered a carrier unless diphtheria organisms had been found in culture of the nasopharynx for a period of more than three weeks. In a group of diphtheria cases observed at this hospital, twenty-two patients fell into this category. These were divided into a control and treated group, the latter receiving penicillin according to the schedule to be

1. Fleming, A.: Antibacterial Action of Cultures of a Penicillium with Special Reference to Their Use in the Isolation of B. influenzae, Brit. J. Exp. Path., 10:226-236, June 1929.

2. Fleming, A.: On the Specific Antibacterial Properties of Penicillin and Potassium Tellurite, J. Path. Bact., Lond., 35:831-842, 1932.

3. Reid, R. D.: A Study of the Bactericidal, Bacteriolytic or Inhibitory Substance Produced by Some Molds and Some Factors Which Influence Its Production, J. Bact., Balt., 25:31, Jan. 1933.

4. Chain, E., et al.: Penicillin as Chemotherapeutic Agent, Lancet, Lond., 2:226-228, 24 Aug. 1940.

described. The control group of twelve cases had had positive cultures for *C. diphtheriae* for four weeks. The treated group of ten patients likewise had been positive for four or five weeks. All cases were observed within the period of 22 August to 1 November 1944. Inoculations into guinea pigs of organisms from positive cultures showed the diphtheria bacillus to be virulent in twelve cases. During the acute phase all patients were treated with at least 20,000 units of antitoxin and all received about 16 gm. of sulfadiazine orally.

METHOD

The penicillin used in this experiment was dissolved in normal saline so that 1 cc. contained 500 Oxford units. By means of an ordinary nose dropper, 1 cc. of this solution was instilled into both nares four times each day for five days. Immediately after instillation, another 1 cc. was sprayed, with an atomizer, onto the fauces and posterior wall of the pharynx. The total amount of penicillin used per patient throughout the five-day course was 20,000 units. Cultures of the nasopharynx were planted on Loeffler's medium every other day after the beginning of the therapy and were continued until three consecutive negative reports had been obtained. No other treatment was used, and all patients of this group were managed in the same manner. The control group of patients was treated with hot saline gargles four times daily. Cultures were taken in this group at least every other day until three consecutive negative reports were obtained. All patients were released from quarantine after three cultures, taken at two-day intervals, were negative.

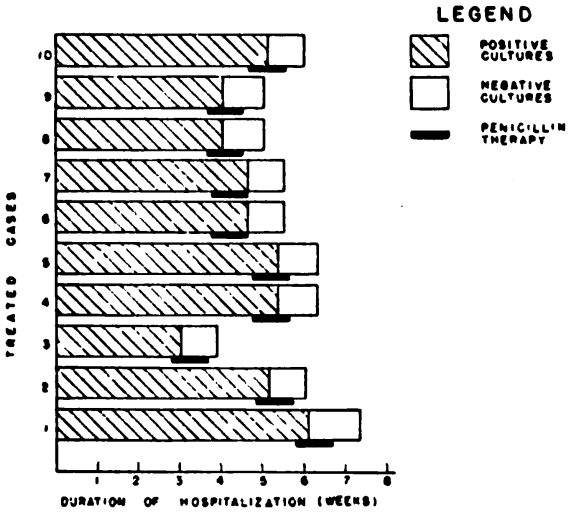


FIGURE 1

RESULTS

In the ten treated cases (figure 1), the throat cultures became negative within the treatment period or on the first day after cessation of therapy. Follow-up observation was possible in eight cases; these were still negative four weeks later. This may be illustrated by the following case reports:

CASE 1. Patient was admitted to the hospital on 22 August 1944, with acute faucial diphtheria. He received 40,000 units of antitoxin, both intravenously and intramuscularly, and 16 gm. of sulfadiazine orally. Cultures, taken at intervals during the first three weeks, were positive for *C. diphtheriae*. During the fourth week, the cultures were taken every

other day to establish a carrier state. On 27 September 1944, penicillin was administered locally for five days. Two days after beginning therapy, repeated cultures were negative.

CASE 2. Patient was admitted to the hospital on 26 August 1944, with acute faucial diphtheria. Therapy consisted of 20,000 units of diphtheria antitoxin intramuscularly and 16 gm. of sulfadiazine orally. Repeated cultures were positive until 27 September 1944, when patient received penicillin locally for five days. Culture of 27 September 1944 was positive, but cultures on 29 and 30 September and 1 and 5 October 1944 were negative.

CASE 3. Patient was admitted to the hospital on 30 August 1944, with acute faucial diphtheria. He received 20,000 units of diphtheria antitoxin intramuscularly and 16 gm. of sulfadiazine orally. Repeated cultures were taken during the next four weeks, but patient remained positive. On 27 September 1944, penicillin was begun locally (nose and throat). Culture on 27 September 1944 was positive, but subsequent examinations on 29 and 30 September and 1 and 5 October 1944 were negative.

CASE 4. Patient was admitted to the hospital on 1 September 1944 with acute faucial diphtheria and was given 20,000 units of diphtheria antitoxin intramuscularly and 16 gm. of sulfadiazine orally. Patient responded well to treatment. Repeated cultures in the succeeding four weeks remained positive. On 27 September 1944, patient was given penicillin locally. Culture on that date was positive for *C. diphtheriae*, but those of 29 and 30 September and 1 and 5 October 1944 were negative.

Seven of the twelve cases (figure 2) in the untreated group reverted spontaneously to negative within the fifth week. The remaining five continued to be positive for a total of six to seven weeks after which it was decided to use these cases as treated controls. They were then treated with penicillin in the manner described. All of these cases became negative as in the treated group; that is, within the five days of therapy or on the first day thereafter. Follow-up examination has been possible in six patients of this group; no positive culture was obtained in any patient.

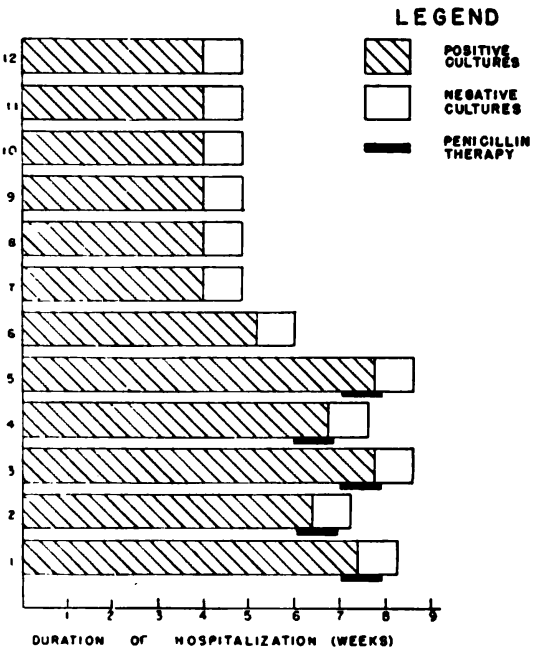


FIGURE 2

CASE 1. Patient was admitted to the hospital on 27 August 1944 with acute faucial diphtheria for which he received 20,000 units of diphtheria antitoxin intramuscularly and 16 gm. of sulfadiazine orally. Response to therapy was good. Repeated cultures were taken and were positive for the next five weeks when patient spontaneously reverted to negative. Cultures during the next one week were negative and patient was returned to duty.

CASE 2. Patient was admitted to the hospital on 2 September 1944 with acute faucial diphtheria proved by culture. He received 20,000 units of diphthera antitoxin intramuscularly and 16 gm. of sulfadiazine orally. Patient responded well to therapy. Cultures were repeated during the next four weeks and remained positive until 30 September 1944. Cultures on 1, 2, and 5 October 1944 were negative, and patient was discharged to duty.

CASE 3. Patient was admitted to the hospital on 15 September 1944 with acute faucial diphtheria. He was treated with antitoxin and sulfadiazine to which he responded well. However, cultures remained positive until 23 October 1944. Penicillin given in the usual manner to the nasopharynx on 20 October 1944 resulted in a reversion to negative of the previously positive cultures. All examinations thereafter were negative.

CASE 4. Patient was admitted to the hospital on 15 September 1944 with acute faucial diphtheria. He received diphtheria antitoxin with good results. Cultures remained positive for *C. diphtheriae* from the onset of the disease until 20 October 1944. It was decided to treat this patient with penicillin; accordingly, he received local applications in the usual manner until 25 October 1944. Cultures on that date and thereafter were negative for *C. diphtheriae*.

CASE 5. Patient was admitted to the hospital by transfer from another hospital because of persistently positive cultures for *C. diphtheriae*, following an acute attack of diphtheria on 23 September 1944. After admission to this hospital on 12 October 1944, cultures remained positive for *C. diphtheriae* until 21 October 1944. Virulence in this case was determined by guinea pig inoculation. Treatment with penicillin was begun on 21 October 1944. On 23 October 1944, a positive culture was obtained, but this was found to be avirulent by guinea pig inoculation; all cultures thereafter were negative.

CASE 6. Patient was admitted to the hospital on 22 September 1944 with faucial diphtheria; treatment consisted of 20,000 units of diphtheria antitoxin and the usual dose of sulfadiazine. He was observed until 25 October 1944 as one of the control cases, and during this interval *C. diphtheriae* was repeatedly obtained by culture from the nasopharynx. It was decided that his carrier state was well established and that he would not revert to negative within a reasonable length of time; accordingly, he was given penicillin in the usual manner on 20 October 1944. Cultures on 25 October 1944, and thereafter, were negative.

COMMENT

Although the number of cases involved in these observations is small, the evidence accumulated suggests that penicillin is effective in the control of such carrier states and is of great value in shortening the period of quarantine necessary. The rapidity with which the organisms disappeared from the nasopharynx indicates that penicillin may be used as an adjunct in the treatment of clinical diphtheria, since it has been proved to exert a bacteriostatic effect on diphtheria bacilli. However, replacement of antitoxin by penicillin is not advocated. This is illustrated by a case of malignant diphtheria treated in another hospital with penicillin before the true nature of the disease was recognized. This patient received 890,000 units of penicillin from the second day to the tenth day of the disease; 80,000 units of diphtheria antitoxin

were administered both intravenously and intramuscularly on the four and fifth days. Despite this treatment, the patient expired on the tenth day of the disease. Death was proved to be due to typical diphtheritic myocarditis.

Further observation of this method of treatment of diphtheria carriers is needed. The instillation of penicillin into accessory nasal sinuses by the Proetz displacement procedure has been suggested as an improvement, insofar as the nasopharyngeal tissues would be bathed constantly by seepage of this material from the sinuses over a seventy-two-hour period.

SUMMARY

Ten proved diphtheria carriers were treated with penicillin, 500 units per cubic centimeter applied locally to the nose and throat for five days. These reverted to a noncarrier status within that period. Seven of twelve proved diphtheria carriers used as controls reverted to negative within five weeks. The other five remained positive for two more weeks. They were treated in the prescribed manner and reverted to negative within six days. It is believed that penicillin offers a quick and simple solution to the problem of diphtheria carriers. A modification utilizing the Proetz procedure is suggested.

Combat Psychiatry

MAJOR CALVIN S. DRAYER*
Medical Corps, Army of the United States
and
CAPTAIN STEPHEN W. RANSON†
Medical Corps, Army of the United States

Psychiatric services overseas have grown and changed in response to needs which have become apparent in the theaters of operations. The exact rationale and nature of these alterations may not be clear to you. It is important that you should understand what has been happening. Whatever your primary medical interests are, the psychiatric problem is so pervasive that each of you will almost certainly have contact with some phase of this problem. In handling cases from overseas, you can be more effective if you know the policies which have caused patients to be evacuated to the United States.

In the Mediterranean Theater, formerly known as the North African Theater, an unusual opportunity arose to develop a psychiatric program fitted to the needs of ground

---

*Acting psychiatrist, Fifth Army.
†Psychiatrist, Fifth Army Psychiatric Center (now with Seventh Army).
Read before the regular monthly meeting of medical officers of the Washington, D. C., area at the Army Medical Center, 18 January 1945.

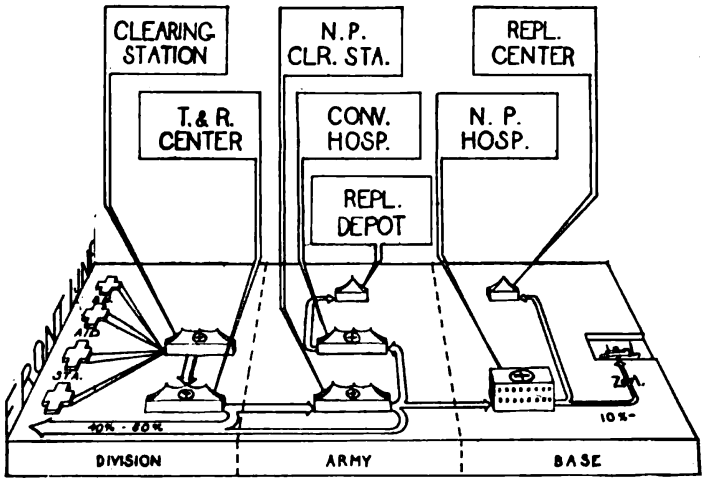
troops in battle. It is interesting that no special arrangements were made to handle psychiatric casualties in the forces which invaded Africa over two years ago. The following factors apparently accounted for this: (1) The restrictions of an amphibious operation limited all shipments to the barest essentials. (2) It seems to have been assumed that existing medical installations would be adequate to handle any psychiatric problems which might arise, even though only the T/O of the 400-bed evacuation hospitals provided specifically for a psychiatrist. (3) A curiously widespread belief prevailed that careful selection had eliminated most predisposed individuals and that we need expect a very small number of neurotic reactions. To our knowledge, the commanding officers of three general hospitals were convinced they would have very few psychiatric cases to care for when they arrived in Africa.

By the time France was invaded a year and one-half later, a great change in thinking had occurred. Psychiatrists were considered essential, neurotic casualties were accepted as inevitable in any heavy action, and a specialized system of psychiatric care accompanied most of the invading troops. Let us examine the evolution of these changes in philosophy.

Prior to the African campaign, no American troops had been engaged in large-scale ground operations. The durability of the present generation of Americans in combat was not known, and the lessons learned in the last war had been somewhat distorted by interpretations during the intervening years. We had come to suspect that anyone who became actually disabled by anxiety in combat probably had some previous defect in his personality. It was not too illogical to conclude that although we knew such a person might be returned to combat by early treatment near the battle site, the results would be hardly worth the effort since the man must have been fundamentally a weakling to have broken down in the first place.

The Tunisian Campaign made clear the urgent need to change this point of view. El Guettar and Kasserine Pass were notorious examples of a significant number of instances in which able and sound men were overwhelmed emotionally by the sheer force of battle experience. In the absence of any concerted effort to deal with these men early and as far forward as possible, their anxiety rapidly became fixed and chronic symptoms were elaborated to an alarming degree. General Blesse, then surgeon for the theater, promptly set in motion measures to deal with the situation. The experiences of Lieut. Colonel Grinker and Major, then Captain, Spiegel in a British general hospital near Algiers contributed to the knowledge of the reactions among American troops. Lieut. Colonel, then Captain, Hanson and Major Tureen went into the battle areas in Tunisia where they were able to show tentatively but convincingly that much more could be done to help psychiatric casualties reintegrate themselves effectively when

they were treated promptly than when they were sent far to the rear. From this point on, various methods were adopted to provide adequate psychiatric care far forward. Early in the Italian campaign, under the immediate direction of Brig. General, then Colonel, Martin, surgeon, Fifth Army, our present procedures began to take shape. The authorization for a psychiatrist in each division appeared at about the same time, and the final push on Rome found us well-equipped psychiatrically. Subsequently, similar services have proved satisfactory in the French campaigns, according to Colonel Thompson, senior psychiatric consultant in the European Theater. The British have been pleased with an analogous setup on the Burmese front. The chart shows the psychiatric structure in the Fifth Army.



Psychiatry reaches as far forward as the battalion aid stations, and the importance of this echelon cannot be overemphasized. Here the crucial decision must be made as to whether or not a man is sick enough to be evacuated. While most battalion surgeons have had little contact with formal psychiatry, it is vital for them to know a great deal about human nature. They must be as ready to administer mental first aid as they are to bandage wounds. The battalion surgeon who is a discerning doctor can accept the reality of most complaints which are brought to him. At the same time he must evaluate whether a complaint is truly disabling. Most battalion surgeons succeed remarkably well, but when they fail the results are distressing. If, on one hand, they rigidly deny the reality of psychiatric disability and call all neurotic reactions "goldbricking," they lose the respect of their unit, and moral suffers. If, on the other hand, they evacuate to the rear most men who come on sick call, the results are even worse. The middle course, the making of a responsible decision in each case, while extremely difficult to follow, must be approximated as closely as possible. It is not easy to send complaining men back to danger and hardship with which the battalion surgeon is painfully familiar from personal experience, when the alternative of giving them a "break" by signing their emergency medical tags is so simple. Division psychiatrists have greatly helped the less secure battalion surgeons by re-enforcing their knowl-

edge of how damaging unnecessary evacuations can be to the strength of each unit and to the health of the individuals concerned. A man in doubt about his own condition becomes more concerned every time the Medical Department sends him farther to the rear, and he tends to cling to his illness as a respectable escape from battle. If, however, the surgeon can honestly reassure him that he is still quite fit for duty, he is free to direct his energies in the direction of continuing as an effective combat soldier. We have elaborated on the importance of this understanding, but firm, policy toward the potentially ill soldier. It is a fundamental feature of all the remaining installations in the psychiatric chain of evacuation we shall describe.

The causalty who is too disturbed to be relieved in the primitive, exposed facilities of the battalion aid station is given enough sedative by mouth to calm him if possible without actually putting him to sleep. He is sent by normal channels with other casualties to the division clearing station labeled by the conventional diagnosis, "Exhaustion." This is by no means an ideal term, but the implied recoverability has seemed helpful in the early handling of this group of cases.

It is current practice in the Fifth Army, at the clearing station, to assign these men to a separate but usually nearby section called the Training and Rehabilitation Center. The patient is thus segregated early from the physically ill and injured who may serve as unconscious patterns for elaboration of his acute anxiety into chronic bodily complaints. He is also somewhat removed from the normal chain of evacuation wherein the high priority of surgical patients often forces premature clearing of medical patients to the rear. At the Center, he is examined quickly but adequately by the division psychiatrist, who estimates his prognosis. The men who show evidence that they may be helped to recover confidence in themselves quickly are reassured intelligently and are allowed two days of rest and relaxation in pyramidal tents on cots equipped with blankets. They receive only enough sedation, as a rule, to ensure sound sleep for two nights; then they are seen again by the psychiatrist who checks their progress in reintegration and secures more details of their stories to permit a reasonably definitive disposition to be made. The obviously recovering soldiers are further reassured with brief explanations of their experiences, and they are then shifted into pup tents where they are quartered for the next four to five days. Although still supervised by the psychiatrist during this period, they are directly under the command of able infantry officers who have led troops successfully in actual battle. The men are issued equipment, including firearms, and they are already regarded more as soldiers than as patients. Every day they are put through vigorous battle training suited to the terrain in which the cam-

paign is being fought. At the end of this period, the men are ready, with very few exceptions indeed, to return to full duty with their units at the front.

So much for the cases with immediately favorable prognosis. Those more severely or chronically disturbed are held at the division level only long enough to permit the division psychiatrist to evaluate them. If, in the psychiatrist's judgment, a man is too sick to recover quickly, he is evacuated promptly to the Army neuropsychiatric center. This is a provisional installation composed of a separate platoon of a clearing company under the direct control of the Army surgeon. Its normal T/O is amplified by the attachment of four psychiatrists and enough enlisted men to provide detailed ward care. A shower unit is available in addition to the usual equipment of such a 200-bed installation. A hot bath and clean clothes contribute to the resocialization of an anxious depressed man. The tents of this Army center are usually set up 10 to 15 miles from the front along a main axis. The war is still very present as trucks of supplies and troops go by repeatedly and the distant guns roar. The hospital atmosphere is minimized. Soldiers continue to sleep in their uniforms, and there are no nurses. The emphasis continues on early recoverability without elaborate care and treatment. Here each man is able to discuss his experience with a psychiatrist at more length than was possible before. If pentothal interviews are indicated for the relief of a true amnesia or a major hysteria, they can be given here conveniently. Sedatives are now avoided as much as possible, because we have come to feel that, after the acute stages of anxiety, these medications confuse more than they help the patient. The sooner he can mobilize all his resources to grapple with his problems, the better will be the ultimate therapeutic result.

Experience has shown that soldiers suitable for return to combat will be ready after three to four days. It has been customary to re-equip them and return them directly to their units instead of routing them through the delays of a replacement center as is done with the medical and surgical cases from the evacuation hospitals.

A setup such as described has been found to return consistently 40 to 60 percent of all combat psychiatric casualties to full duty within less than a week after their initial evacuation out of the line. This figure represents the combined efforts of the division and the Army psychiatrists. Eighty percent of these returnees remain on duty and 55 to 60 percent of them are regarded by their commanding officers as being as good as, or better than, they had been before they lost grip on themselves. Contrast these results with the 2 percent it was possible to return to combat duty early in the Tunisian campaign from the hospitals in the rear to which most of these cases found their way.

For those whose tolerance for combat will be restored only after a long time, or perhaps never, two dispositions are possible. The psychotic patients and the severe neurotics with long-standing complaints obviously do not belong overseas. They are sent to the base section neuropsychiatric hospital, where they are rechecked and sent by hospital ship to the zone of the interior for final disposition. Only a small percentage of our combat cases require this handling at the present time. Most of the remainder do not require further medical care, and in fact they may be harmed by fixation of their symptoms if they continue to be under the direct care of medical officers. A few cases do need more time and therapy than can be provided at division and Army levels to help them recover from acute anxiety, and they are sent to the base section neuropsychiatric hospital, where they can be reclassified later for assignment to noncombat jobs. The majority, however, can and should be handled more expeditiously. It is our firm belief that a useful service job is the best doctor for these men. They tend to have strong feelings of failure at this stage, and the sooner they can show themselves that they are still of value to the Army, the sooner they regain a durable stability in the organization of their personalities. We have therefore arranged in the Fifth Army for them to be reclassified very promptly at the Army's convalescent hospital after they have been thoroughly evacuated at the Army neuropsychiatric center. In this manner they leave the medical chain of evacuation while still in the Army area. At no point have they worn pajamas or slept between sheets; at no point has the Army considered them sick enough to provide a nurse to care for them. It is made very clear that they have suffered a real but temporary disability from which the Army knows they can and will recover rapidly.

Our emphasis overseas is on abilities rather than disabilities. We are convinced that this policy is good for the Army and good for the individual man. It saves manpower when intelligently applied, and the trends toward widespread, chronic invalidism are definitely aborted. A man does not have to be perfect to continue as a good and valuable soldier.

Effective Hospital Administration. The patients are kept busy with hobbies and work of their own selection; that is, perhaps, one factor in maintaining the high morale, which is self-evident. The staff and personnel make it their business personally to see that every patient is conscious of the fact that he is really a guest of the Government for wounds and disease incurred in line of duty. I think that is the answer to effective hospital administration. (Extract pertaining to a U. S. Army hospital, from a letter to Major General Norman T. Kirk, The Surgeon General)

Vol. IV
No. 1

Meningococcic Pneumonia

MAJOR NORMAN B. ROBERG
Medical Corps, Army of the United States

Holm and Davison[1] studied 1,510 cases of epidemic influenza, 403 of which had some form of pneumonia, of which 85 cases showed, predominantly, meningococci in the sputum. Only *B. influenzae* and the pneumococcus were more common than the meningococcus, and the hemolytic streptococcus ranked fourth. In 98 sputum cultures, the influenza bacillus was recovered in pure culture in 7 cases, and in mixed culture in 23 cases; the pneumococcus was pure in 11, mixed in 14; the meningococcus pure in 7, mixed in 16; the hemolytic streptococcus pure in 9, mixed in 11. These figures show that the four organisms were of about equal prevalence, and that all four were present more often in mixed than in pure culture. Of the 403 cases of pneumonia in this series, there were 78 deaths. Cultural studies at autopsy showed 23 of the 78 to be caused by the meningococcus. During the same period there were 22 cases of meningococcal meningitis with 13 deaths. It is to be emphasized that the patients with meningococcal pneumonia did not have meningitis.

The symptoms of the meningococcal pneumonias appeared to merge with those of the primary influenza, and the physical findings were predominantly those of bronchopneumonia, occasionally that of frank lobar pneumonia. Most of the patients were toxic, pale, and cyanotic. The temperature ranged from 103° to 106° F., the pulse rate from 85 to 100 per minute, and the respirations from 25 to 30 per minute. The sputum was at first thin, then became creamy white with numerous pus cells and gram-negative diplococci. The patients either died in several days, or underwent a protracted convalescence with suppurative bronchiolitis. Blood cultures, apparently taken in all cases, were negative. Of the 23 fatal cases of pneumonia which had predominantly or pure meningococcal cultures at autopsy, only 4 had blood leukocyte counts of more than 10,000, and they were of mixed infection with either a pneumococcus or a hemolytic streptococcus. Mixed infection with the influenza bacillus did not raise the white cell count above 10,000. Of the 13 cases with pure meningococcal infection, the leukocyte count did not exceed 10,000, and in all but 2 cases ranged from 2,000 to 7,000. Late in the illness, with recovery, there was leukocytosis.

At autopsy the pneumonia was "usually of bronchopneumonic type with numerous points in the consolidated areas that exuded purulent fluid on pressure. Six cases were distinctly lobar in distribution. On section, the consolidated areas showed a peculiar pale violet color that appeared almost characteristic of meningococcus pneumonia. The pleura was generally quite free from exudate and the pleural surfaces were generally dry." "The abdominal recti muscles were found ruptured in five cases." "The upper bronchi were generally inflamed and covered with creamy pus. Meningococci were always found to be most numerous in the purulent exudate from the bronchioles. Cultures from the pericardium and pleural cavities never showed meningococci." The types of meningococci recovered from the lungs were essentially the same as those found in the cases of

Because of lack of space, this article has been abbreviated by omitting most of the author's review of literature.

1. Holm, M. L., and Davison, W. C.: Meningococcus Pneumonia, Bull. Johns Hopkins Hosp., 30:324-329, November 1919.

meningitis which occurred at the same period. During the four-month period of this epidemic of influenza wherein these cases of meningococcal pneumonia occurred, the monthly carrier rates in the afflicted troops were 16, 12, 8, and 5 percent.

The following case of meningococcal pneumonia was observed during the spring of 1944 at a time when no case of meningococcal meningitis was under treatment.

A white soldier, 18 years of age, entered the hospital on 24 January 1944 complaining of a severe, harsh, dry cough, one week in duration. Physical examination was normal except for dullness, diminished breath sounds, and showers of sticky crepitant rales over the lowest one-third of the chest, posteriorly and bilaterally. For six days the patient was moderately sick, fever ranging from 100° to 104.5° F., pulse varying from 100 to 110 per minute, and respiratory rate from 20 to 30 per minute. The blood leukocyte count varied from 9,200 to 12,600 during the first days of the illness. He coughed up copious quantities of thick, yellow sputum, and there was no prevalence of pneumococci or hemolytic streptococci. Roentgenograms of the chest on the second and fourteenth days were reported as "essentially negative." The patient improved by lysis, with gradually increasing aeration of both lower lobes, and diminution of the coarse rhonchi and crepitant rales. Sulfadiazine, maintained at a level of 5.9 to 9.2 mg. per 100 cc. of blood, exerted no appreciable influence on the course of the illness. He was discharged after twenty-two days with the diagnosis of pneumonia, primary, atypical, right and lower lobes, etiology unknown.

Five weeks following discharge from the hospital, the patient was readmitted with complaints of progressive sore throat, malaise, chills, and fever for two days. Except for a "head cold" for ten days prior to readmission, the patient had felt well since leaving the hospital. Physical examination on admission was normal except for moderate injection of the pharynx, fine moist rales at the base of the right lung, and a temperature of 103°, pulse rate of 100 per minute, and respirations of 26 per minute. Roentgenography of the chest on admission revealed findings "consistent with the changes seen in atypical pneumonia, in the base of the left lung." The leukocyte count was 6,200. The patient was treated symptomatically. Within twenty-four hours there developed a diffuse, irregular, pale, morbilliform rash over the entire body, principally on the trunk, with scattered lesions on the face. Koplik's spots, coryza, and conjunctival suffusion were lacking. The patient was mildly cyanotic, and over the entire chest anteriorly and posteriorly were showers of fine crepitant rales. Many rhonchi were present, which would clear with coughing, and the patient brought up copious amounts of whitish-yellow sputum. All observers were impressed by the fluid creamy sputum which was white with only a tinge of yellow, so dissimilar to the mucoid sputum of pneumococcic and streptococcic pneumonia and to the tenacious yellow or green purulent sputum of the bronchiolitis seen late in cases of measles or of atypical pneumonia. Smears prepared from the sputum showed myriads of polymorphonuclear leukocytes with numerous gram-negative intracellular diplococci; on culture the sputum yielded 75 percent meningococci and 25 percent hemolytic streptococci, group A. The organism was identified on two occasions by its failure to grow at room temperature on blood agar, by its good growth on chocolate agar under carbon dioxide at 37° C., and by its agglutination with the polyvalent meningococcus agglutinating serum (horse) supplied by the Army Medical School.

The patient was violently ill from the third to the eighth days, being cyanotic in an oxygen tent, irrational, restless, with labored respiration

and pronounced coughing with large amounts of the same creamy sputum. Crepitant rales, fine to coarse, filled both lungs, diminishing slowly during the first week. The temperature ranged from 100° to 105° F., the pulse from 90 to 130 per minute. Sulfadiazine, maintained at a level of 2.3 to 9 mg. per 100 cc. of blood, had no obvious influence on the disease, and the patient improved by lysis after the eighth day. By the sixteenth day he was well, the chest showed only moderate dullness and crepitant rales at the base of the left lung, and the sputum gradually had changed to the thick, greenish plugs usually seen late in atypical pneumonia. Cultures of sputum, and from the nose and throat, were negative for meningococci. Leukocyte counts on the first, third, and fifth days were 6,200, 6,600, and 10,700. Blood culture, under 10 percent carbon dioxide, taken before sulfadiazine was given, showed no growth.

The resemblance of this case to those of Holm and Davison is close. Five weeks following recovery from a pneumonitis, probably of viral etiology, the patient developed a severe, diffuse meningococcic pneumonitis, became cyanotic and suffered vascular collapse, brought up large quantities of creamy, white sputum, had a leukocyte count of 6,000, and improved slowly with sulfadiazine therapy to an uncomplicated recovery. Holm and Davison do not mention any exanthemata in their patients, and the blood cultures were negative. This patient had a morbilliform rash, which was not of the embolic, petechial type seen in meningococcemia. Jochmann[2] mentions the occurrence of morbilliform rashes, followed by a branny desquamation, in meningococcic meningitis. This type of rash may well be "toxic" in origin.

Considering the observation by Holm and Davison of 85 cases of meningococcal pneumonia and 22 cases of meningococcal meningitis during the same period, it is possible that meningococcal pneumonia may be more common than is recognized. Apparently their meningococcal pneumonia cases occurred as a secondary infection in influenzal pneumonitis, rather than as a primary pneumonitis. At this station, and possibly at others, it has not been the practice to culture sputa of patients with primary or secondary bacterial pneumonia under conditions favorable to the growth of the meningococcus. The routine use of such technique might reveal a higher incidence of meningococcal infection. The profuse discharge of meningococci by a patient coughing heavily is of obvious epidemiological significance.

SUMMARY

A case of meningococcal pneumonia, apparently primary, is reported, and the paucity of reference to this disease in standard medical texts is emphasized.

Meningococcal pneumonia might be more frequently recognized if more emphasis were placed on the meningococcus as an etiological agent, and if sputa were routinely cultured under conditions favorable to the growth of that organism as well as the pneumococcus, *Streptococcus*, and *Staphylococcus*.

2. Jochmann, G.: Lehrbuch der Infektionskrankheiten fur Arzte und Studierende. Berlin: J. Springer, 1914.

Acute Infections of the Hand

Acute infections of the hand are of importance, both in theaters of operations and in the zone of the interior. They are a source of significant numbers of temporary and even permanent disabilities. Prompt recognition followed by correct evaluation and adequate treatment is essential if noneffectiveness and loss of function resulting from these conditions are to be reduced to a minimum. Surgical drainage of the infected hand should be the responsibility of the most experienced surgeon available.

The *diagnosis* of the presence of an acute infection of the hand can be made easily. The patient usually presents himself because of the pain in the part and other characteristic signs and symptoms of inflammation. Exact diagnosis of the tissue space or spaces involved, however, can only be made by one having a thorough knowledge of the anatomy of the hand. Careful inspection followed by precise palpation should be meticulously and gently performed in every case. Of paramount importance in every case of hand infection is a complete clinical examination of the deep fascial spaces, the tendon sheaths, and radial and ulnar bursae, in order that the extent of the infection will be well understood prior to surgery.

Certain *general therapeutic principles* should be applied in all cases of acute hand infection, regardless of the space or spaces involved. These may be collocated as follows:

1. All patients with acute infections of the hand should be promptly hospitalized.

2. As soon as the diagnosis has been established, *adequate surgical drainage* of the involved space or spaces should be performed immediately. Conservative measures, e.g., hot packs and hypertonic saline soaks employed in lieu of adequate drainage, are frequently responsible for extension from one involved space to the other.

3. The dissection should be of an unhurried, deliberate, and precise character. Thus, the routine use of *general anesthesia* is essential. A bloodless field made possible by the use of a *tourniquet* further contributes to the performance of an accurate dissection which opens only the involved space or spaces.

4. Postoperatively, efficient immobilization of the affected extremity in the position of maximum function by means of a voluminous dressing is of extreme importance.

5. Confinement in bed, with the affected part elevated above heart level by pillows, should be a routine order in all cases.

6. Drains should be prepared of dry or petrolatum fine mesh gauze. They should be introduced so as to prevent agglutination of raw wound surfaces. They should never be "packed" in place or come in direct contact with nerves or tendons.

From the Surgical Consultants Division of The Surgeon General's Office.

7. Penicillin in dosages of 200,000 units or more every twenty-four hours should be administered systemically until the infection has subsided. The local application of chemotherapeutic agents is not advocated.

The following drawings depict certain anatomical considerations and incisions which are important in the surgical drainage of infections of the hand.

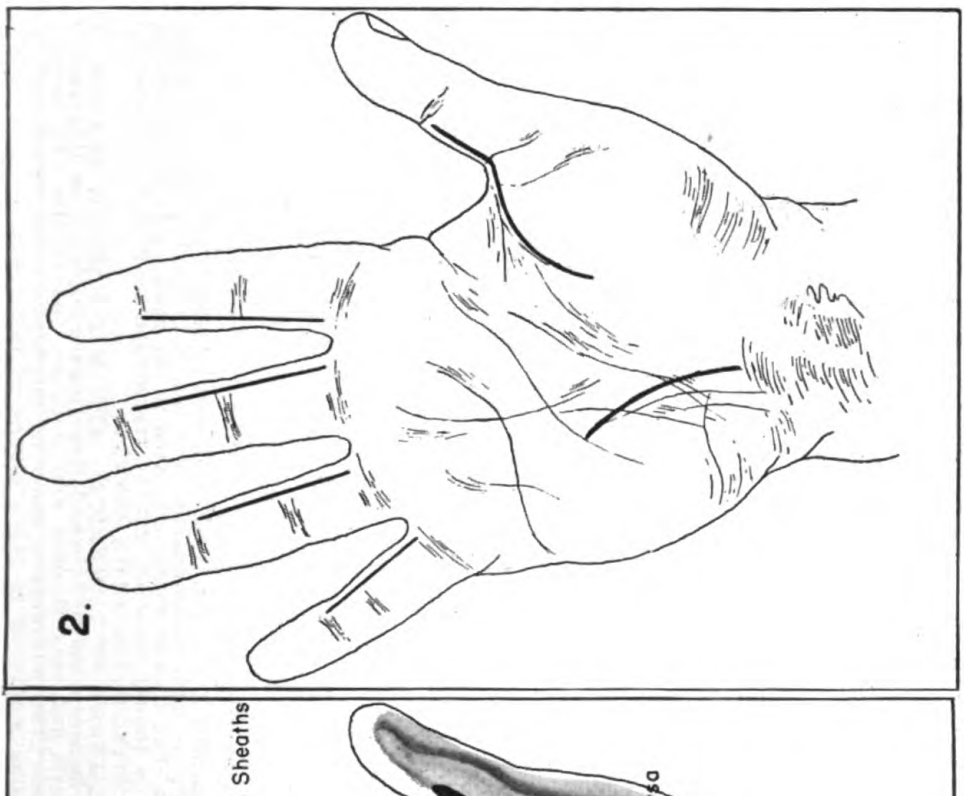
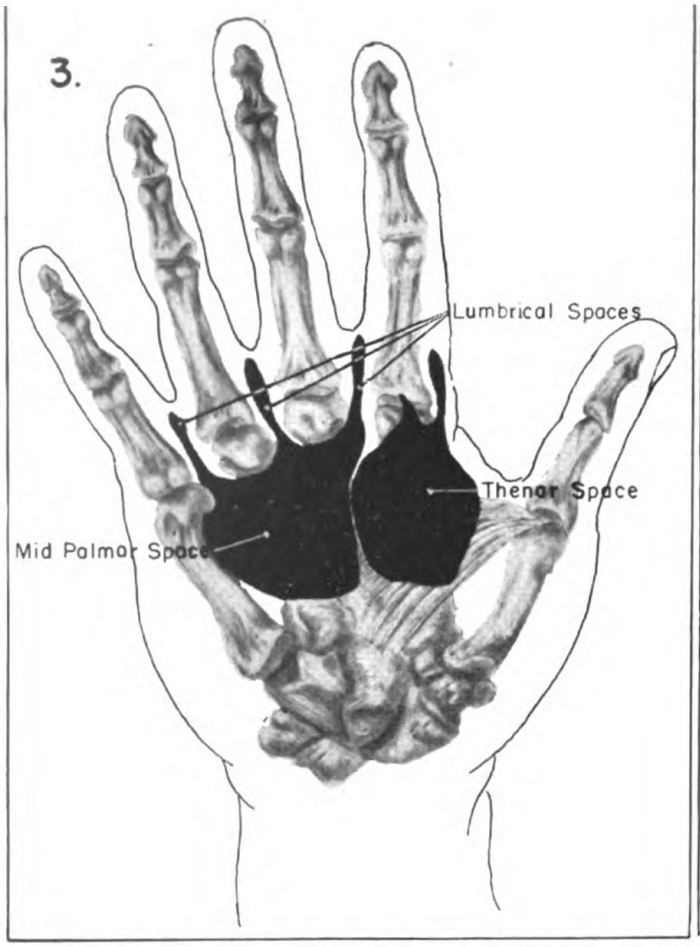


FIGURE 1. ANATOMY OF FLEXOR TENDON SHEATHS AND BURSAE. The tendon sheaths and bursae are located immediately deep to the palmar aponeurosis. Note that the flexor tendon sheaths of the thumb and little finger are continuous with the radial and ulnar bursae respectively. The bursae themselves frequently communicate, as illustrated.

FIGURE 2. INCISIONS EMPLOYED IN SURGICAL DRAINAGE OF INFECTIONS OF THE FLEXOR TENDON SHEATHS AND BURSAE. Note that the incision for opening the index finger tendon sheath is located on the ulnar side of the index finger. This avoids the creation of a scar on the opposing surface of the index finger. The incision for the combined drainage of the tendon sheath of the thumb and radial bursa should never be extended higher than 2.5 cm. below the transverse carpal ligament, in order to avoid



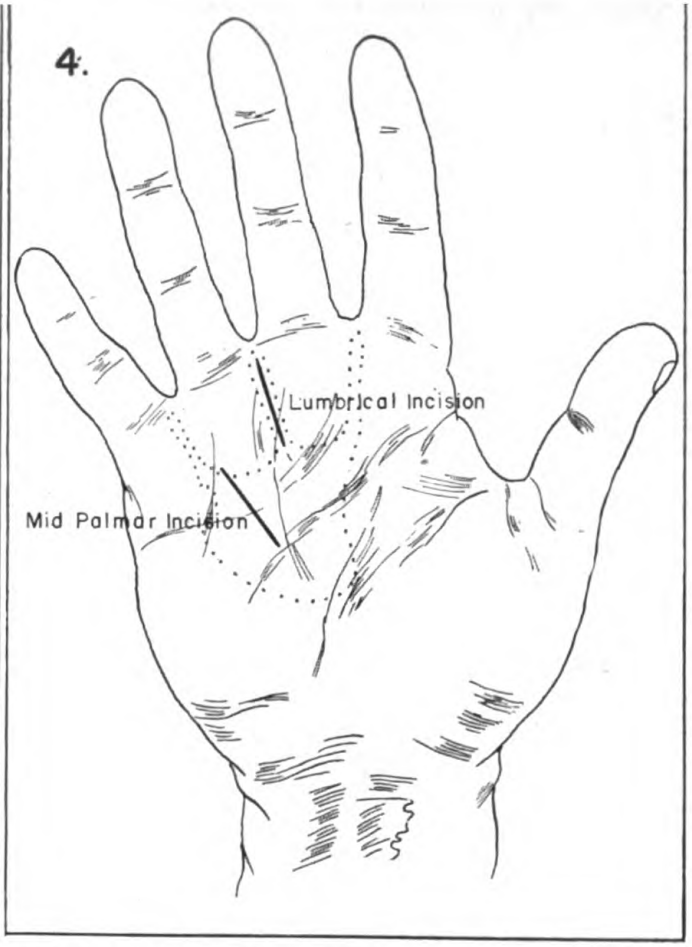


FIGURE 3. ANATOMY OF THE MID-PALMAR, THENAR, and LUMBRICAL SPACES. The mid-palmar space is located to the ulnar side of the middle metacarpal and lies between the flexor tendons and metacarpals of the ring and little fingers. The thenar space is located to the radial side of the middle metacarpal and lies deep in the palm between the thenar muscles and the transverse head of the adductor policis. The lumbrical spaces lie immediately adjacent to the tendon sheaths.

FIGURE 4. INCISIONS FOR DRAINAGE OF LUMBRICAL AND MID-PALMAR SPACES. The incision for drainage of the lumbrical space between the middle and ring fingers is placed as diagrammed. Similarly, the lumbrical spaces between the little and ring fingers and between the middle and index fingers are opened by incisions over these spaces. The mid-palmar space is indicated by the dotted outline in order to indicate its relationship to the incision employed in the drainage of this space.

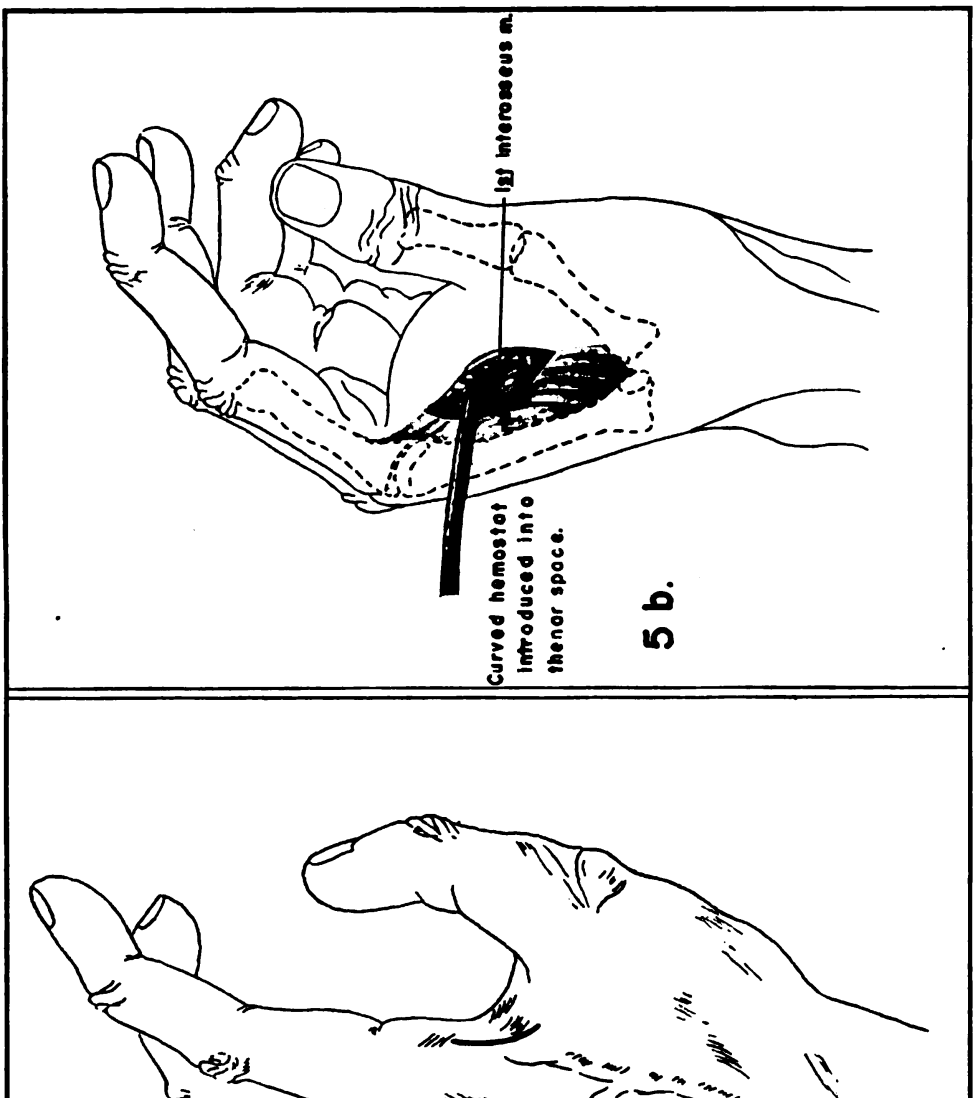


FIGURE 5. INCISION FOR DRAINAGE OF THE THENAR SPACE. The muscles of the thenar eminence render the thenar space inaccessible through incisions made in the palm of the hand. The incision of the skin and subcutaneous fat should be placed on the dorso-radial border of the hand as illustrated in figure 5a. Since the thenar space is deep to the muscles of the thenar eminence as noted above, drainage of the space requires the introduction of a curved blunt hemostat around the radial border of the hand into this deeply seated space (figure 5b).

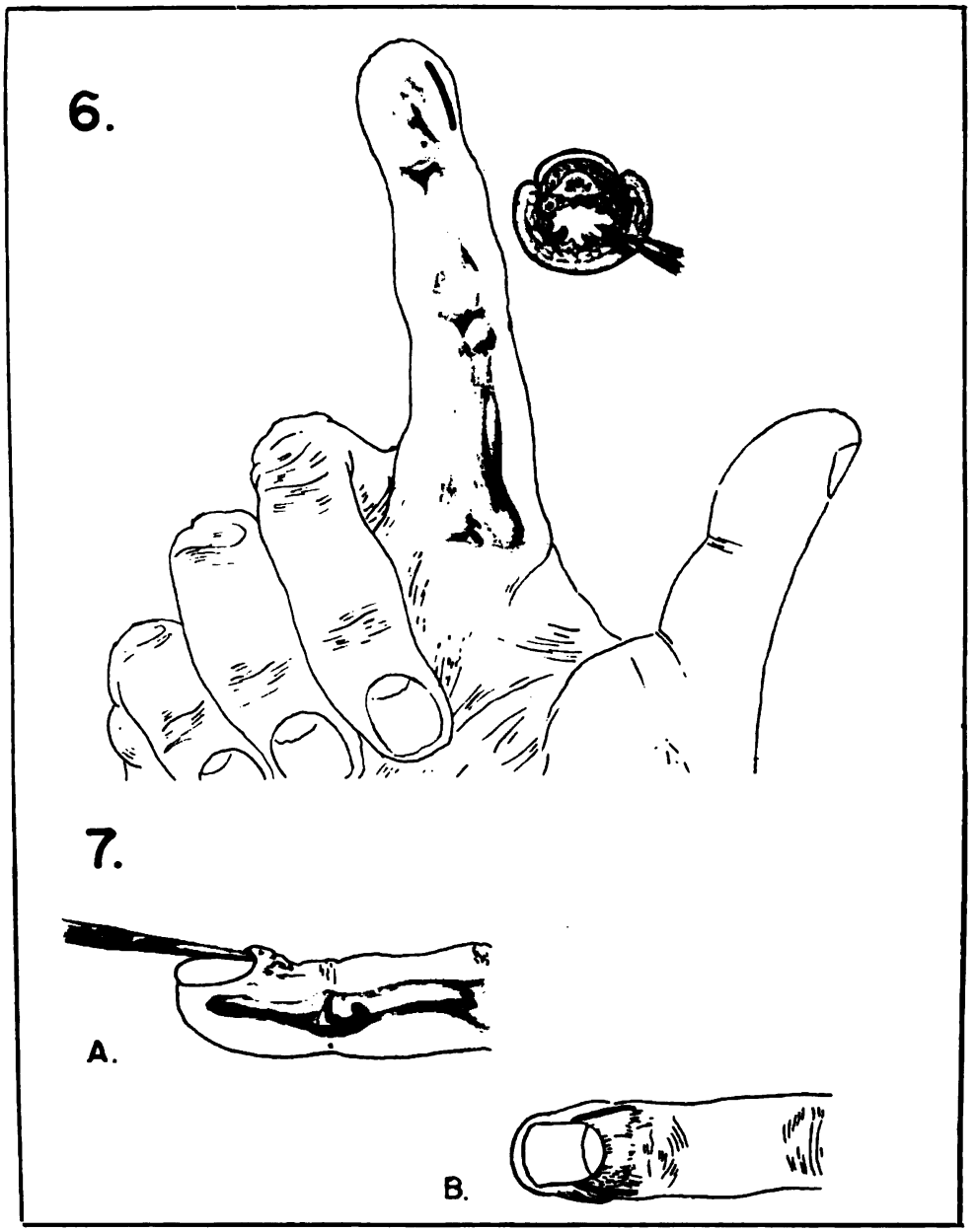


FIGURE 6. SURGICAL DRAINAGE OF DISTAL CLOSED SPACE INFECTIONS. The extent of the skin incision for an infection of the distal closed space of the finger (felon) is illustrated. Care should be taken to divide all soft tissues for the entire extent of this incision. The skin of the tip and opposite side of the finger should not be incised. When necrosis of the distal phalanx is noted to have occurred, removal of loose sequestra is permissible but should not disturb the epiphysis of the distal phalanx. The epiphysis is usually viable because its blood supply is derived from vessels which enter proximal to the distal closed space and are unaffected by tension within the space.

FIGURE 7. SURGICAL DRAINAGE OF EPONYCHIA AND PARANYCHIA. Eponychia usually may be drained adequately by simply elevating the eponychium as illustrated in figure 7a. This should be followed by the introduction of a small drain of fine mesh gauze between the skin and the base of the nail. "Run-arounds" require lateral incisions as presented in figure 7b. These should be carried through skin and soft tissues down to the nail. The skin and soft tissues should then be dissected from the base of the nail and that portion of the nail covered by this flap removed whenever the infection has extended deep to it.

Vol. IV
No. 1

Information Regarding the Effect of Malarial Attacks on the Health of the Individual

A great deal of misinformation and misunderstanding exists concerning the effect of repeated relapses of benign tertian malaria on an individual's general health. Anxiety caused by such ignorance in itself may seriously impair medical fitness. For this reason, it is important that accurate information based on latest available data be thoroughly disseminated among all troops who have been, or may be, exposed to malaria.

Under current War Department directives all commanders are responsible for the initiation and enforcement of the measures necessary to control malaria within their units and unit areas. It is their duty, moreover, to see that unit medical officers thoroughly instruct officers and enlisted men in methods of prevention and suppression of malaria. It is also extremely important that unit medical officers make available to line officers and enlisted men reliable information concerning the significance of malarial attacks, especially relapses, from the point of view of their effect on the individual's health. In particular, medical officers in charge of patients should explain the subject thoroughly to their patients who have malaria.

Adequate measures prevent infection with malaria, except in a negligible number of individuals. The importance of carrying out these measures is stressed. However, at the beginning of combat operations in highly malarious areas, the institution of adequate control measures may be impossible and a certain number of individuals engaged may become infected with malaria. Moreover, there are a number of individuals in the Army already infected with malaria which has not yet run its course. Experience shows that under appropriate management nearly all such individuals can be maintained in the state of health requisite for the performance of the most exacting duties of military service.

Benign tertian malaria, due to *Plasmodium vivax*, is the only type of malaria with military significance which commonly causes repeated attacks or relapses. Available treatment does not prevent relapses of malaria due to *P. vivax* after the treatment is discontinued. It is well known, however, that relapses of all types of malaria can be avoided, or suppressed so that no clinical activity of the disease can be detected, by the continued taking of an antimalarial drug such as atabrine (see TB MED 65 and TB MED 136). The use of atabrine actually

From the Medical Consultants Division, Surgeon General's Office.

cures the form of the disease known as malignant tertian malaria caused by *Plasmodium falciparum*, with the result that relapses rarely occur.

When attacks of malaria do occur, if medical treatment is instituted promptly and adequately, the symptoms are relieved with great rapidity and all progress of the disease is quickly suppressed. In most cases, symptoms are relieved within forty-eight hours. As a result of prompt and efficient action, attacks of malaria by themselves cause only brief incapacitation and result in no permanent damage to the body. It is of interest to note that, because of advances in knowledge concerning treatment and handling of individuals with relapses of malaria, the number of days lost in hospital has been reduced from fourteen or fifteen days to about seven. Deaths due to malaria in Army personnel in the whole period since the beginning of the war have been rare and nearly always associated with other diseases in addition to malaria, and with circumstances which caused delayed or inadequate treatment. Any impairment of health which does arise from attacks of malaria is relieved by simple measures in a relatively short time. Even in individuals in whom a large number of relapses have occurred, the cumulative effect on the body has been slight or nil. In general, the severity of the attacks decreases and the effectiveness of treatment increases as time goes on.

Worry and anxiety over the significance of infection with malaria may do more harm than the properly treated disease itself. For this reason, an understanding of malarial relapses and of their lack of serious import for the patient's general health contributes enormously to improvement in the individual's well-being and fitness.

Relapses of malaria may be precipitated, in infected individuals who are not taking adequate suppressive medication, by many forms of activity. It has been demonstrated by exhaustive studies, however, that individuals who are protected by the use of regular, adequate, suppressive medication are not subject to relapses of malaria even though undertaking strenuous activities. Comparison of Army experience in northern and southern sections of the United States shows there is no evidence for the popular belief that climate has any lasting effect on malarial relapses.

Many soldiers do not realize that the standard Army treatment for malaria is the best available. It has the backing of Army experience all over the world and, in addition, of the most experienced civilian authorities in the country. The Board for the Coordination of Malarial Studies, which regularly advises the Medical Department, constantly collects from all over the world information about the treatment of malaria. There is no reason to believe that any particular individual or institution possesses a private or secret cure for

relapsing malaria. Numerous drugs and other agents are advanced from time to time as cures for malaria which are, for the most part, useless. Often a method is considered a cure merely because the patient is not followed long enough for a relapse to be observed. When any new method offers promise of being good, it is thoroughly investigated.

There is a great deal of misunderstanding concerning the yellow color of the skin associated with the use of atabrine. This color is not due to jaundice or to any other derangement of body functions. It is due to the fact that atabrine is yellow and is deposited in the skin. The yellowness disappears spontaneously after use of the drug is discontinued.

Unless properly instructed about the natural course of benign tertian malaria, soldiers are inclined to think that once infected they will have malarial attacks for the rest of their lives. It should be emphasized that this is not true. Malarial relapses do not continue to occur indefinitely, even though suppressive medication is discontinued. Some individuals have only two, three, or four attacks. In general, relapses tend to be successively less severe and to occur after increasingly long intervals. Only rarely do individuals have relapses after two or three years have elapsed from the time of their last infection.

Soldiers should be instructed that, though infected with malaria, they should not consider themselves a menace to their fellows, their families, or their communities, provided they promptly obtain medical treatment if any symptoms occur. Malaria can be spread only by anopheline mosquitoes, and, in general, mosquito control measures are adequate to prevent its spread.

In the final analysis, relapsing malaria is not a disease greatly to be dreaded by the individual, in comparison with other dangers to which the soldier is exposed. Medical officers should see that men under their care, especially those with malaria, acquire a satisfactory understanding of pertinent facts about the disease.

Radio Distribution System for Army Hospitals.—A standard radio program distribution system for installation in all Army general hospitals in continental United States has been developed by the Signal Corps and approved by The Surgeon General. The system, the finest ever installed, consists of a central control console and amplifier equipment to provide four simultaneous program channels, being so arranged that any type of program, except television, may be received and rebroadcast. Each bed patient may choose one of four programs by the mere pull of a string attached to a bed unit which may be placed under the pillow or hung at the head of the bed. The unit may also be used as an acoustical headset. In wards and places of public assembly where the patient can move about, loudspeakers are employed.

Sewage Disposal for Small Installations

A problem of particular interest to the Medical Department is the sanitary disposal of sewage at numerous small installations. With the tremendous task placed on the engineers to build airfields, docks, and roads, it is necessary, at times, for medical units to install their own waste disposal systems. Conservative water-borne disposal practices for groups of from ten to one thousand persons are described as a guide to those who do not have engineering references readily available. Sewage must not be discharged carelessly, and particular care must be taken to prevent pollution of drinking water sources or bathing areas, or creation of fly or mosquito breeding areas.

The services of a sanitary engineer are as necessary in the design and construction of small sewage disposal systems as in the building of more imposing engineering structures. Sanitary engineers (MOS 7960) of the Sanitary Corps are widely dispersed throughout the army, many serving with malaria control units or as assistant medical inspectors. They are capable of rapidly laying out sewage disposal systems, and all commanding officers should use the services of these skilled men in solving their sewage disposal problems.

In designing these disposal systems, the following factors should be considered: location of wells, springs, streams, and other sources of drinking water; location of bathing areas and shellfish grounds; estimated daily sewage flow; capacity of the various strata of soil for the absorption of sewage (consideration must be given to critical wet seasons); the danger of encouraging mosquito breeding; and the prevention of nuisance.

In estimating the quantity of sewage the following figures are suggested. The gallons of sewage per capita per day in a semipermanent camp are estimated at 25, and in permanent posts and hospitals at 50. These estimates must be modified according to circumstances. The requirements of the maximum month may exceed those of the average month by from 14 to 40 percent. Also, consideration should be given to probable expansion.

Percolation test. To determine the capacity of the soil for absorption of sewage, the following test is very useful. Dig a hole one foot square to the approximate depth at which the sewage is to be discharged into the soil. If a tile field is to be

---

From the Sanitary Engineering Division, Surgeon General's Office.

Figure 1 from "Rural Water Supply and Sewage Disposal Systems," Bulletin No. 26, New York State Department of Health, Albany, N.Y., 1939; figures 2, 3, and 4 from "Engineering Handbook: Land Development: Section 5: Sanitary Standards for Disposal of Sewage and Domestic Wastes in Rural Areas," U. S. Department of Agriculture, Soil Conservation Service, Washington, D. C., August 1940.

used, a depth of two feet is sufficient; but if cesspools are constructed, the test hole should be extended to the mid-depth of the cesspool. Fill with water to ensure thorough moistening of the soil, and allow the water to seep away. Then, while the bottom of the hole is still moist, fill to a depth of 6 inches and observe the time required for the water level to fall one inch. The bottom area of the trenches of the tile field or the effective leaching area of cesspools may be estimated from table I.

Cesspools. The simplicity and cheapness of cesspools make them a useful sewage disposal device for small temporary installations where the subsoil is porous and where there is no danger of polluting subsurface water supplies, as shallow wells, or nearby streams. Except for installations to be occupied for a short time, cesspools should be preceded by settling tanks to remove grease and solids which tend to seal quickly the openings in the soil and destroy the usefulness of the cesspool. Because of their simplicity cesspools are often installed where other types of sewage disposal should be employed.

TABLE I

Time for water to fall one inch, in minutes.	Approx. length of tile in field or effective leaching area in sq. ft. in cesspools per 50 gal. sewage per day.
2	15
5	20
10	30
30	60
Over 30 generally unsuitable.	

Do not use cesspools above or within 100 feet of a source of water supply such as a well or spring, where the ground water is within 8 feet of the surface, or where there is a tight clay subsoil.

Settling tanks. For small installations, either the septic tank or the Imhoff tank is a satisfactory settling tank for the removal of settleable and floating solids. The capacity of the soil for absorbing sewage should always be conserved by removal of the solids in settling tanks in all cases except at temporary installations where cesspools can be used.

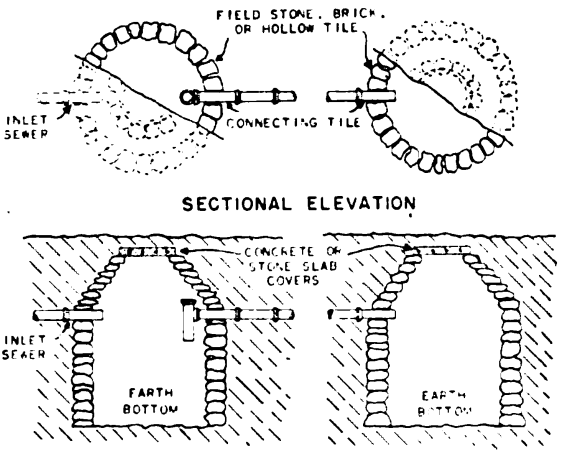


FIGURE 1. Typical leaching cesspool construction.

Septic tanks. The essential features of a septic tank are the inlet baffle to distribute the flow evenly across the width of the tank, and the outlet baffle or submerged pipe, to prevent the escape of floating scum. The inlet pipe should be three inches higher than the outlet pipe. Septic tanks should

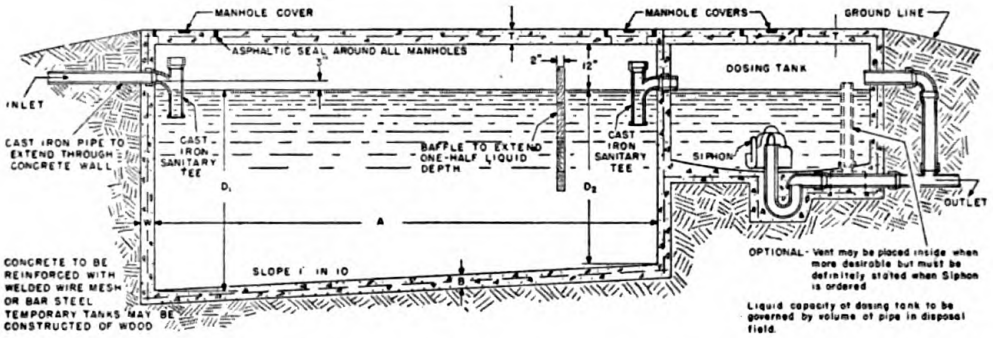


FIGURE 2. A typical septic tank.

have capacities as shown in table II. For installations with 200 men or more the Imhoff tank should be used in preference to the septic tank.

TABLE II

Septic Tank Capacity Gal.	Suggested Dimensions A	B	D_1	D_2	Daily Sewage Flows Gal.
1000	7	4	6	4	1000
1500	10	4	6	4	1500
2000	10	5	6′-6″	4	3000
2500	10	6	7	4	5000
5000	15	6	9′	6′	10,000

A septic tank will protect cesspools and tile fields to a certain extent from clogging, but septic tank treatment alone results in only a minor degree of purification. The effluents from septic tanks are objectionable and cannot be discharged on the surface of the ground into ditches or into small streams without creating nuisances and conditions which may be detrimental to health. The additional treatment necessary is described below under "Subsurface Tile Systems," "Artificial Sand Filters," and "Contact Beds."

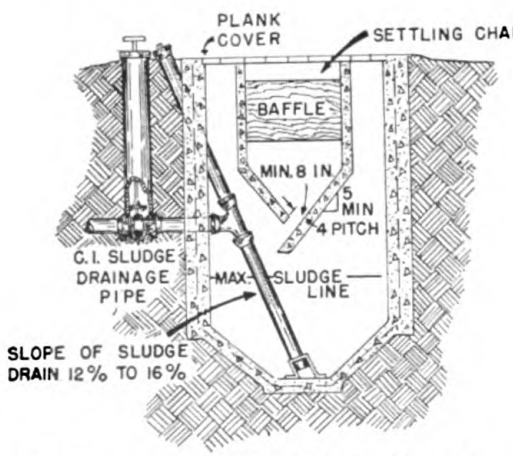


FIGURE 3. A typical Imhoff tank cross section.

Imhoff tanks. For installations serving over 200 men or where the daily flow of sewage is in excess of 10,000 gal., consideration should be given to installing a two-story or Imhoff tank. These tanks have the distinct advantage of separating the settling or flowing through compartment from the compartment for holding

and digesting sludge. With this arrangement, the settling chamber is filled with quiescent fresh sewage in which the solids settle rapidly without interference from rising gas bubbles or floating scum and with less tendency to mix with septic liquor than in the septic tank.

In two-story or Imhoff tanks the flowing through channel should have a detention period of not less than two hours, baffled inlets and outlets, bottom slopes of not less than 1¼ on 1, and slots not less than 6 inches wide with an overlap of not less than 6 inches. The sludge compartment should have a capacity of 3 cubic feet per capita, measured below a plane 18 inches beneath the slot; gas vents not less than 18 inches wide and not less than 25 percent of the total plan area of the tank and a freeboard of 12 inches; and bottom floor of digestion chamber hoppers with slopes not less than 1 on 2. Sludge pipes should be at least 6 inches in diameter. The discharge pipe from the sludge riser should be under an initial head of not less than 4 feet with slopes of not less than 3 percent.

Subsurface tile systems. This system is suitable, where soil conditions are favorable, for the final disposal of a septic tank effluent. The system comprises a field of drain tile, or the equivalent, laid in a pattern shaped to the topography so the effluent of the septic tank will be distributed throughout the field. The liquid wastes seep from the tile into the surrounding soil. This system for the disposal of septic tank effluent should be used rather than cesspools whenever the ground water level is less than eight feet below the surface or where the water supply is obtained from near-by wells.

For installations where the length of tile is less than 300 feet, only one field is necessary and no dosing chamber or automatic siphons are required. A typical tile field suitable for fairly level ground is illustrated in figure 2. The main distributor should preferably be not less than 4 inches in diameter, laid with tight joints and fitted at intervals from 4 to 9 feet with *Y* branches to which the laterals should be connected. The lateral drains should be of 4-inch drain tile, laid with open joints about one-fourth inch wide. A single lateral should not be over 100 feet in length. The entire pipe should be surrounded by clean gravel or crushed stone from a level four inches below the pipe to a level 2 inches above the top of the tile. All lateral distributors should be laid so that the tops are from 18 to 24 inches below the surface of the ground. The grades of the laterals must be very flat, not over 3 inches per 100 feet, determined by the aid of a level. To exclude soil from the section around the pipe, the gravel or stone should be covered with tar paper, hay, grass, or straw, or, if stone or gravel is plentiful, the trenches may be filled to grade with these materials.

In installations requiring over 300 feet of tile, dosing tanks equipped with automatic siphons should be provided with a net capacity equal to three-fourths of the capacity of the pipe in the

portion of the systems which is dosed at one time. Where the length of the tile laterals exceeds 1,000 feet, the dosing tank should be provided with two siphons, each serving one-half the tile field and dosing in alternation. Where manufactured siphons are not available, most engineers can devise one from tile or sheet metal.

Artificial sand filters. Where the soil is so tight that subsurface irrigation systems and leaching cesspools are not practical, a sand filter may be required, and should be constructed as shown in figure 4. The filter should be designed for a rate of filtration of 1⅙ gal. per sq. ft. per day or 50,000 gal. per acre per day. The filtering material should be clean coarse sand, all passing a one-fourth-inch mesh and having an effective size between 0.25 and 0.5 mm. and a uniformity coefficient not greater than 4.0. In the larger installations, dosing tanks with automatic siphons should be provided with a capacity to flood the beds to a depth of between 1 and 4 inches, and dosing apparatus of a size to give a rate of discharge at minimum head of at least two times the maximum rate of inflow. The sewage should be applied to beds by means of distribution troughs laid on the surface.

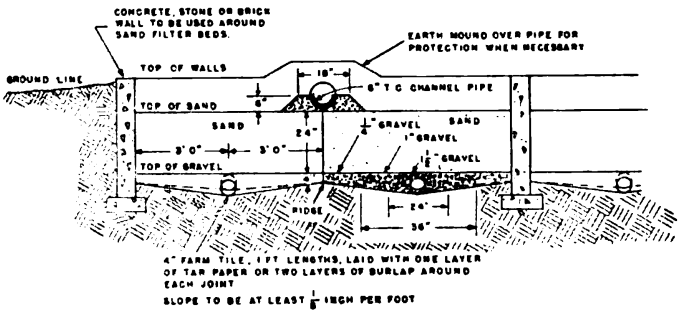


FIGURE 4. Section of sand filter bed.

In places where the filter must be located where it may be unsightly, it may be covered. For very small installations, the subsurface sand filter may be installed as a filter trench, three to four feet wide by whatever length is necessary, with a single distributor lateral and a single underdrain.

If agricultural tile is not available, distributors may be made from flat stones or boards.

Contact beds. The contact bed is useful in treating settled sewage, where an effluent of some stability is required. The contact filter consists of a bed of one-inch stone about four feet deep in a water-tight tank, of such size as to permit an 8-hour operating cycle about as follows: (1) filling period 3 to 4 hours, (2) standing full period 1 to 2 hours, (3) emptying period one hour, and (4) resting period, bed standing empty 3 to 4 hours. The filling and draining can be performed by automatic siphons, but in most overseas installations they will have to be done manually. Distribution of the sewage is usually by means of troughs, much the same as the distributing devices on sand filters.

DISCUSSION

Of necessity, this discussion of sewage disposal methods is brief and limited in detail. Since the sanitary engineers in the

field are available to advise on design and construction, there should be no difficulty in obtaining sufficiently complete information about practical procedures in liquid waste disposal.

It is realized that pipe fittings, valves, and other materials and supplies will often be missing and not readily obtainable. Fortunately, sewage disposal systems readily lend them selves to improvisations; so, with the plentiful supply of Yankee ingenuity in stock, there should be many successful uses of strange and unusual materials. The Surgeon General's Office will be interested in learning about achievements of this kind that give good results.

Civilian Health Problems in the European Theater

Until recently there was ample reason to fear that civilian health conditions in western Europe might actually menace military operations, but fortunately the purely military danger has now passed. Under the Nazi regime public health deteriorated seriously in Europe, and penetration of enemy-occupied territory was expected to add further to the hazard of epidemics of potentially great military significance. The G-5 public health program of SHAEF and lower medical echelons was planned so as to minimize this hazard during both the military phase and the phase of transition to the assumption of responsibility by the Allied Control Council. In recent months hundreds of thousands of displaced persons, refugees, and prisoners of war have been found, many in a pitiable state of nutrition and health, and a disorganized, mass movement of huge proportions has taken place in eastern Germany. Despite this, epidemic diseases in Allied-controlled territory have at no time exceeded the bounds of reasonable control, except for local outbreaks which have been rapidly checked.

Command responsibility in forward areas of extensive destruction has necessarily placed some load on the field medical service, but estimates of the volume of such care are not yet available. Despite the large numbers of civilians found by recent military operations there has been no word that forward medical installations were unable to cope with the load until civilian facilities could be provided for relief. A report of the U. S. Third Army for February states in part: "A great difficulty presents itself in that there are little or no medical facilities in some sections of the forward areas, XII Corps Zones. There are no doctors, no hospitals, no medical supplies, no ambulances—a complete medical vacuum. A Public Health officer of this Headquarters has been assigned to the VIII Corps Zone to attempt the re-establishment of civilian medical service." Penetration of the enemy zone of interior during April has created an ever-increasing load for Army medical

service, particularly with respect to personnel but not excluding supply. A new problem has come from the fact that German military hospitals have been overrun, necessitating the assignment of U. S. medical personnel for purposes of command and supervision.

Although the public health situation never really interfered with military operations in the European Theater, it has been, and continues to be, serious according to public health standards. Many of the problems have only begun and may be expected to intensify under the mass movement of refugees. Especially important diseases include diphtheria, typhus, tuberculosis, dysentery, hepatitis, and scabies. U. S. Army personnel are exposed in part through contact with refugees and displaced persons, and only continued alertness on the part of Army and Civil Affairs preventive medicine personnel will guarantee a reasonable degree of epidemiological control. The chief dangers threaten the displaced persons, refugees, and the indigenous populations of liberated and enemy territory rather than Army troops.

Diphtheria is a serious problem in Europe today. During the decade prior to the war, diphtheria was greatly declining in countries neighboring on Germany, despite the fact that artificially induced immunization was not widespread. In Germany, however, diphtheria increased during this period, and the chaos of the war exposed the Netherlands, Belgium, Denmark, and Norway to a risk of infection comparable only to that which existed prior to the discovery of immunization and serum therapy. The case-fatality rate, previously on the decline, is also reported to have increased substantially in certain areas. Hungary, on the other hand, was protected from diphtheria by an excellent immunization program.

Sporadic outbreaks of dysentery and typhoid have been reported in displaced-persons camps and in certain occupied towns, and acceptable standards of sanitation have often not been maintained in civilian facilities because of military destruction, overcrowding, lack of medical personnel, and the necessity for improvisation at every turn. Scabies is reported widely prevalent among displaced persons and refugees who have been examined. None of these disease problems has been acute, however. More serious are the reports of greatly increased incidence of tuberculosis, the general state of malnutrition, and the threat of typhus. Precise and authentic data on tuberculosis and malnutrition are still lacking, but nutrition teams are in the field making observations; however, it is apparent that the official rations set by governments of France, Belgium, and the liberated portions of the Netherlands even now fail to provide sufficient food to meet average nutritional requirements, although infants under one year, expectant and nursing mothers, and children of three to six years are said to be well cared for. All foods of major importance

are rationed, and the official diet must often be supplemented by black market purchases with resulting unevenness in distribution. Early in the period of German occupation, the nutritional status of northwest Europe became very bad; thereafter, to increase production, priority groups were better fed. The situation in France and Belgium today is better than under German control. In Holland because of the nature of the liberation the situation is as bad as or worse than it was during German occupation and is now being given first priority. A mild to moderate undernutrition is general throughout northwestern Europe, although the general health of the urban population appears not to be far above the border line of nutritional safety, and serious consequences would probably flow from any material worsening of the present dietary.

Among the communicable diseases, louse-borne epidemic typhus continues to present the greatest challenge to civilian health, the immunity of U. S. troops being well established by typhus vaccine. They have also been kept quite louse-free. After the last war, typhus ravaged eastern Europe. Latest available reports from Rumania, where before the war there were several thousand cases a year, mention 30,000 new cases in December 1944. The disease developed with explosive rapidity in Naples during the winter of 1943-1944. During this war typhus has increased in Germany as well as in eastern Europe. Up to the end of April about 2,900 civilian cases had been reported from territory under SHAEF control. The greatest number of cases of typhus fever have occurred in German prisons, where living conditions have been atrocious. The prevention of epidemic, louse-borne typhus rests in large part on delousing, which has become highly efficient with DDT and appropriate dusting equipment. To prevent the spread of the disease westward, a sanitary cordon was established along the Rhine in March and orders issued that all civilians would be deloused on the far side of the cordon when crossing. In addition, delousing is routine for all typhus patients, for all immediate or remote contacts, and for displaced persons and others who have been in Germany, Poland, or the Balkans, and for lousy refugees and lousy inmates of concentration camps, jails, or other institutions. The supply of DDT being limited, it is used for dusting only those groups which are most likely to spread typhus fever. Strategic reserves are maintained centrally under military control for use should an extensive epidemic threaten. The efficient Cox-type typhus vaccine used for U. S. Army personnel is being employed for doctors, hospital personnel, staff personnel in displaced persons and refugee centers, and the like. It is fortunate that the collapse of Germany, with its inevitable confusion, disorder, and extensive migration, should occur at a season when control is easier than during the winter months. A lapse of control now might well mean an explosive epidemic next winter.

INFECTIONS ABOUT THE LOWER JAW

COLONEL BRADLEY L. COLEY
Medical Corps, Army of the United States

Infections following extractions of teeth most frequently follow extraction of a molar, particularly the third molar. The swelling and trismus may suggest Ludwig's angina, but the latter arises in the floor of the mouth, while infections complicating molar tooth extractions are confined to an entirely different region—the masticator space described by Coller and Yglesias,[1] Dingman,[2] and Hall and Morris.[3] The masticator space is inclosed by a fascial sling which surrounds the mandible and the muscles of mastication, the masseter laterally and the internal and external pterygoid medially. Infection in connection with a tooth extraction or a jaw injury is confined by this fascial sling which is adherent to the periosteum of the inferior surface of the mandible. Pus is ordinarily prevented from appearing in the neck but may extend up along the ramus to a point in the temporal region where it may be deep, or superficial to the temporal muscle.

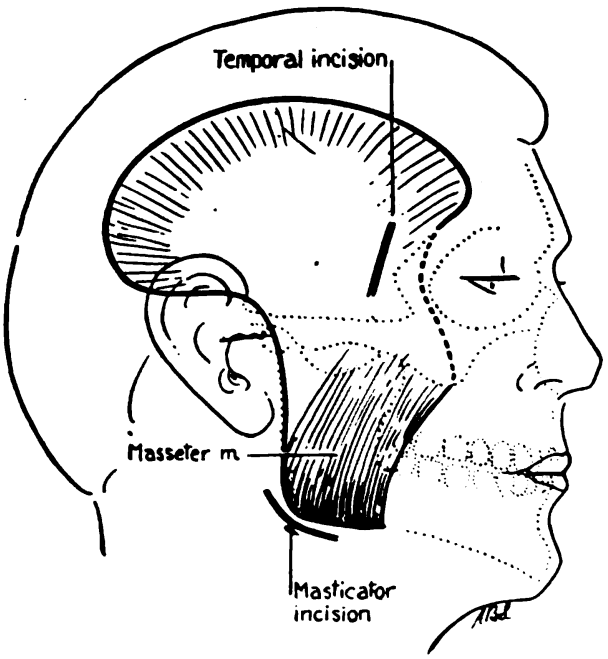


FIGURE 1. Lateral view showing extent of the masticator space (Coller and Yglesias). Heavy lines indicate the boundaries of the space. The region containing the lower teeth and lying anterior to the masticator muscles is the space for the body of the mandible (Coller and Yglesias). The temporal and masticator incisions are shown.

Masticator Space Infection

Pain, trimus, and swelling of the jaw may appear within twenty-four hours of the tooth extraction. If they do not subside rapidly, the condition generally goes on to suppuration. In about one-half the cases spontaneous discharge of pus in the neighborhood of the alveolar margin occurs, followed by rapid improvement.

When spontaneous regression fails to occur, there is increase in pain, swelling, fever, leukocytosis, and manifestations of toxemia. In the early period intensive chemotherapy, supplemented by hot fomentations and warm mouth irrigations, is the method of treatment, but if after seven to ten days the infection has not subsided or spontaneous drainage been established, surgical intervention is necessary; if after ten to fourteen days drainage has not been established,

Author is indebted to Hall and Morris for permission to use illustrations.

1. Coller, Frederick A., and Yglesias, Luis: Infections of the Lip and Face, Surg. Gyn. Obst., 60:277-290, Feb. 1935.
2. Dingman, Reed O.: Management of Acute Infections of the Face and Jaws, Am. J. Orthodontics, 25:780-794, Aug. 1939.
3. Hall, Colby, and Morris, Francis: Infections of the Masticator Space, Ann. Otol. Rhinol., 50:1123-1133, Dec. 1941.

osteomyelitis of the mandible is nearly certain to result and with it a long and tedious convalescence. External incision beneath the ramus of the mandible and along it is much preferred to intra-oral incision; it should pass down to bone unless pus is obtained more superficially.

While these infections are less often complicated by respiratory embarrassment than are cases of Ludwig's angina, the administration of a general anesthetic is fraught with some danger. Sodium pentothal is considered unsafe; nitrous oxide-oxygen is the least objectionable. The procedure should not require depth of anesthesia and should be brief.

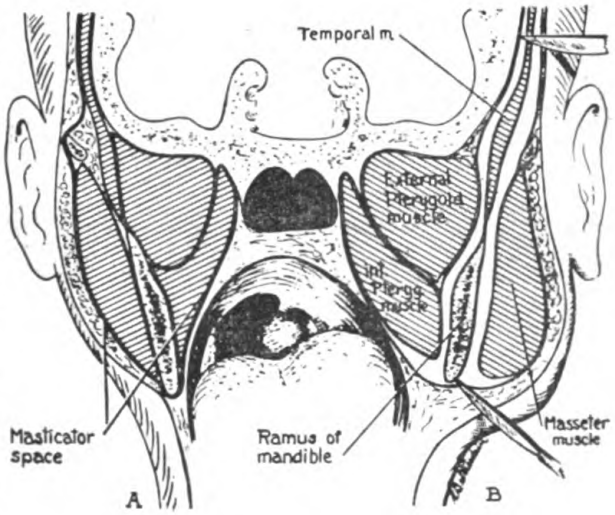


FIGURE 2. Diagrammatic frontal section. Heavy lines represent the fascial sling, containing the masticatory muscles and the ramus. **A,** normal side. Fascia is attached to mandibular periosteum inferiorly. The periosteum is firmly adherent to the mandible along its inferior aspect. **B,** diseased side. Intra-oral and external swellings both are shown. Extension upward along the ramus into the temporal pouches is clearly seen. Scalpels indicate the extent of the masticator and of the temporal incisions.

PROSTHETIC DEVICE FOR SUPPORT OF EYELIDS

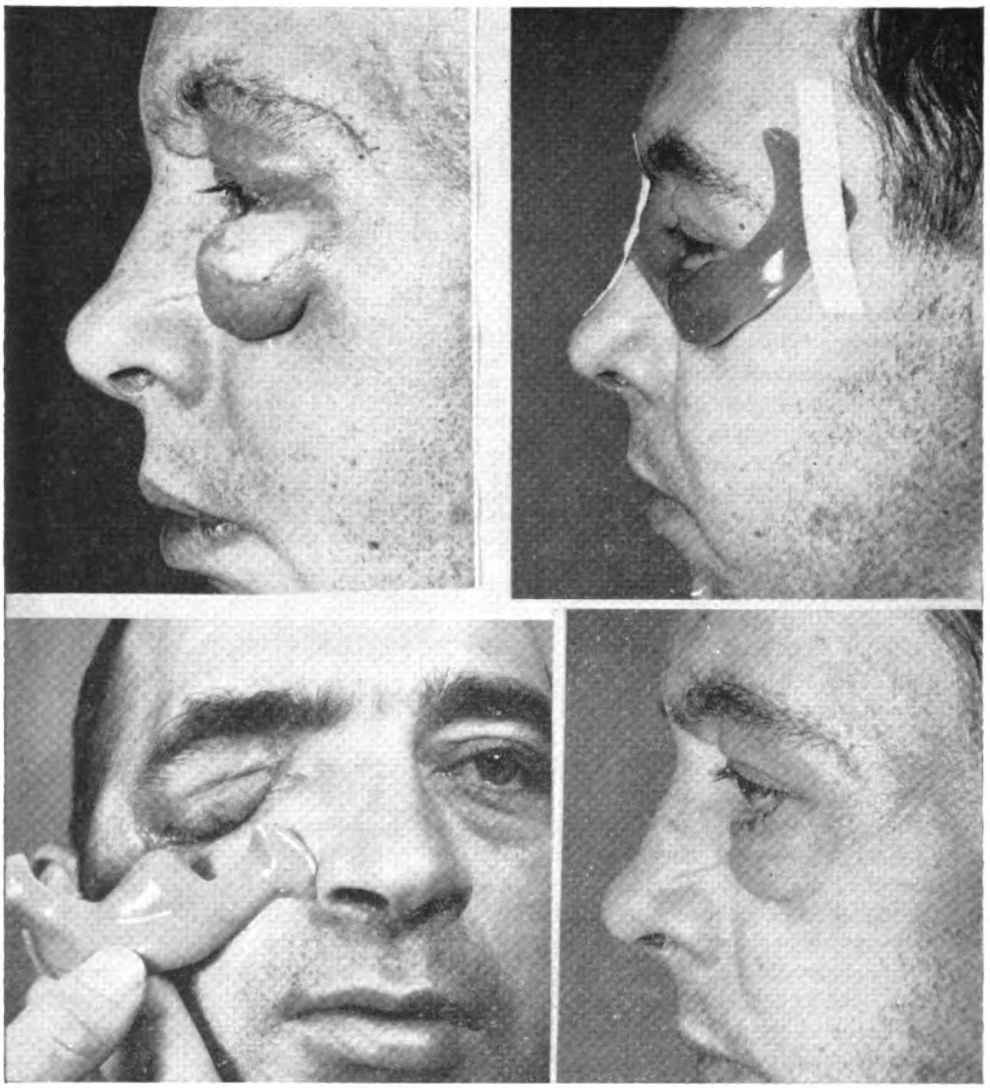
MAJOR JOHN J. KOHOUT
Dental Corps, Army of the United States

A frequent type of shrapnel wound of the face results in the loss of an eye and lower lid, accompanied by a deep cicatrix extending to the ear. The upper lid is left unsupported, frequently the levator action is absent, and the orbit is fractured. Edema occurs, and, since the venous return is very poor and the additional factor of gravity is present, a cycle of increasing pathologic physiology is developed. A similar ocular war injury is the dislocation of the lower lid at the inner canthal ligament, combined with a circular scar which is adherent to the maxilla. As the edema develops, the lower lid acts as a valve closed upon itself and a similar state of affairs results as in the upper lid. Not only does this defective metabolism result in lowered vitality of the lid, but it increases the difficulty of reparative surgery.

A plan was conceived by which support might be given these pendulant structures by making an acrylic prosthesis which would use the most convenient bony support, namely the nasal, zygomatic, maxillary, and temporal bones.

The technique for making these prostheses is as follows: A wax boxing is adapted to the patient's face and a colloid impression is made. If the orbit opens into the antrum or nasal cavity, it may be packed with petrolatum gauze. With the aid of cotton-tipped applicators, some of the colloid material is particularly directed beneath the pendulant lids. The colloid is strengthened by adding a layer of plaster of paris. It is then removed, hardened with fixing solution, boxed, and dental stone is poured

in to make a cast of the facial abnormality. The approximate outline of the prosthesis is then designed upon it after it hardens. Then a strip of wax, 3 or 4 mm. in thickness, is used to fill in the outlined area in such a way that an exact model of the prosthetic device is made, holding up the lid while resting against bone. This wax model is then invested in a flask, using methyl methacrylate in the usual manner of making a dental appli-



Top, left to right: (1) shows extent of the edema, (2) lateral view of the prosthesis which allows also frequent irrigation of the cul-de-sac, which a bandage will not, (3) lateral view of prosthesis removed, showing the convex surface on central raised portion which supports the upper lid, (4) shows decrease of edema after wearing the prosthesis three weeks. The illustrations are of two patients.

ance. The surface of the prosthesis is finished with an arbor band and then polished. It is then inserted on the patient, being held in place partly by adhesive tape.

Patients state that they feel quite comfortable wearing this device. The edema is rapidly corrected and the prognosis for successful reparative surgery is greatly improved.

DOUBLE SKELETAL TRACTION IN BATTLE FRACTURES OF THE LOWER FEMUR

CAPTAIN JOHN MODLIN
Medical Corps, Army of the United States

The reduction of fractures of the lower half of the femur, especially those of the lower third, is often difficult to obtain by means of the standard method of skeletal traction. The malalignment which usually occurs is that of posterior displacement of the distal fragment (figure 1). The measures usually employed to correct the deformity are those of flexion of the knee and a tight sling across the popliteal space and posterior distal thigh. Prolonged fixation in this position often results in: pain in the popliteal space; edema of the popliteal space, leg, and foot; phlebothrombosis and thrombophlebitis; malalignment with posterior displacement of the distal fragment; and flexion contracture of the knee with accompanying quadriceps atrophy and patellar fixation.

A method of double skeletal traction has been successfully used in twenty-three battle fractures of the distal half of the femur. A Kirschner wire or Steinmann pin is placed in the tibia at the level of the tubercle for the usual skeletal traction, using either the Thomas splint with Pierson knee attachment, or the Joldersma or Navy type traction. A second Kirschner wire is placed through the distal femoral fragment, the point of insertion of the wire usually being near the level of the upper border of the patella, although this varies with the level of the fracture. The wire is inserted from the medial side of the thigh to avoid possible injury to the femoral vessels. Twenty-five pounds' traction is placed on the tibial wire in the long axis of the femur and 10 pounds' traction in an anterior (upward) direction is placed on the femoral wire at about right angles to the long axis of the femur (figure 4). Since reduction is most easily secured within the first ten days, daily x-rays are taken until reduction is satisfactory, the amount of pull on each wire being varied as indicated. In the usual case, it will be found that the amount of weight on each wire may be substantially lessened following reduction. A daily program of supervised quadriceps and knee-bending exercises is started as soon as the condition of the wound will permit, the average time being about three weeks after traction is instituted, and continued until traction is removed. The femoral wire is removed when the fracture is solid and the danger of bowing is slight, usually at six to eight weeks.

FIGURE 1

In Plaster on Admission to Base Hospital

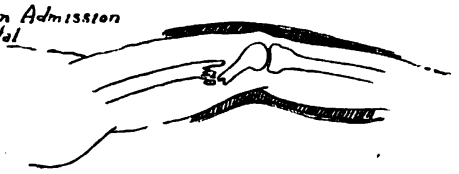


FIGURE 2

Tibial Tubercle Traction

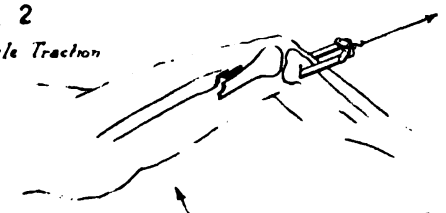
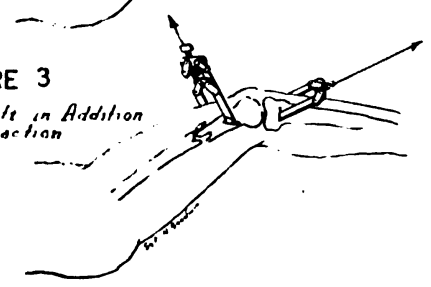


FIGURE 3

Femoral Lift in Addition to Tibial Traction



Infection has not arisen in any case at the site of the femoral wire. The proximity of wounds of the lower thigh is not considered a contraindication to the method. With the use of penicillin, the wire has on occasion been placed through a clean open wound with no un-

toward result. Figure 1 is a tracing of the preliminary x-ray of a battle fracture of the lower femur. Figure 2 shows the position obtained by means of the usual single pin method of skeletal traction. Note that a moderate degree of posterior displacement of the distal fragment persists. Figure 3 shows the position obtained in the same case, after insertion of a Kirschner wire through the distal femoral fragment. The femoral wire in this case has been placed some distance proximal to the patella to obtain a better mechanical advantage.

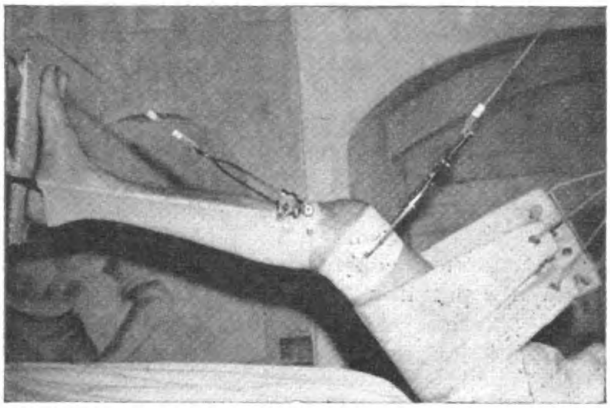


FIGURE 4

The end results in the twenty-three fractures treated by this method have been encouraging, since the additional wire has allowed accurate reduction of the deformity without the hazards mentioned. The patients have been more comfortable and earlier motion has resulted in more rapid recovery.

DUTIES OF POST SANITARY ENGINEER

CAPTAIN LEWIS L. GWIN
Sanitary Corps, Army of the United States

The Sanitary Corps sanitary engineer assigned to a camp, post, or station has numerous responsibilities regarding general sanitation and sanitary engineering. He acts as a consultant and advisor to the surgeon on such matters. He should be well qualified in sanitary and/or civil engineering in order that he may reach decisions expeditiously and correctly. In this way, he will win the confidence of the post commander, post surgeon, post engineer, area engineer, or other professionally trained officer personnel. He must be willing at all times to convey to others the knowledge he has gained in sanitary engineering and sanitation as applied to military establishments.

The sanitary engineer of a post, in line with his principal duties, gives consultant and advisory service to the surgeon relating to (1) safety and suitability of the water supply; (2) efficiency of the sewage disposal procedure; (3) preparation for and the determination of the adequacy of the insect, rodent, and vermin control; (4) establishment of swimming pool or bathing beach control; and (5) surveys of other allied engineering conditions.

Water Supply

The expansion of water systems presents numerous problems for the sanitary engineer, demanding immediate attention. He is called on to examine and approve sources of water supply, type of treatment proposed, if any, and general recommendations concerning these points. He must be constantly aware of sources of pollution or cross-contamination with sewers. He must approve the final detailed plans and specifications for all new construction or general alterations to water distribution systems, filtration and pumping plants, and deep well pumps.

Presented at conference of Sanitary Corps officers, Third Service Command, 1-2 May 1945.

In the constant checking of the water system, the sanitary engineer should establish regular sampling points for bacteriologic samples. These points should be so arranged geographically that all principal parts of the distribution system are covered. He should make periodic inspection trips to filtration, softening, or pumping stations to determine exact operating procedures, and advise the post engineer or utilities officer of any recommendations which will improve operating conditions, such as coagulation, settling, filtration, or chemical control. Detailed chemical and bacteriologic samples should be collected by a trained enlisted man. Such training should be given to him by the sanitary engineer.

It is a good plan for the sanitary engineer to be constantly in touch with all utility officers so that he will be aware of all proposed changes in operating procedure or in new construction work and proposed additions to the system. The post sanitary engineer should maintain complete plan files and operating records of all separate water systems and appurtenances of the post, camp, or station.

Sewage Disposal

A considerable portion of the post sanitary engineer's time should be spent in sewage disposal and related subjects. He should always keep the surgeon advised relative to the operation of these plants, both from the general point of view of health of the troops and their families housed on the post, the esthetic viewpoint, and the effect, if any, on bathing beaches. It is the responsibility of the sanitary engineer to approve plans and specifications for all proposed changes or additions to sewerage systems, sewage disposal plants, septic tanks, down to the location of deep pit latrines for bivouac areas. The proposed elimination of all insanitary methods of disposing of sewage should be recommended to the area or post engineer, as such nuisance must be abated for the protection of the health of the troops.

As changes occur in strength of the command, an immediate effect on the sewage disposal plant or plants is felt. The sanitary engineer must keep informed so that through his recommendations the entire sewage disposal process is not upset. Such items as sludge bulking, pH control, chlorine residual, settleability tests, and BOD control should be uppermost in his mind. Methods of sludge drying, removal, and disposal must be studied and approved.

The sanitary engineer should maintain complete files on the basis for design of all plants, with all operating capacities. He should maintain a complete drawing file of all sewerage systems and sewage disposal plants. By weekly chemical analyses of the raw and treated sewage as conducted by personnel of the post engineer or state health department, he may advise the post engineer of any recommended changes to the operating procedure.

Insect, Rodent, and Vermin Control

The control of insects, rodents, and vermin is the responsibility of the post engineer and unit commander. Advice relative to the methods and materials for control, as well as general supervision and advice falls to the sanitary engineer of the post. In insect control, particularly mosquitoes, his knowledge of drainage is invaluable. He should know methods of control and habits of ticks, mites, roaches, mosquitoes, chiggers, ants, and termites. He will be constantly called on for advice on the control of these insects. The presence of rats on a post presents a general picture of poor housekeeping. The elimination of rats is the responsibility of the post engineer and, to assist him, the sanitary engineer is called on for

recommendations in the control of rats, particularly in and adjacent to post dumps or sanitary fills. The habits of all rodents should be known to the sanitary engineer.

Swimming Pools and Bathing Beaches

In the study of swimming pools and bathing beaches, the post sanitary engineer conducts necessary preliminary examination of the location, type, and number of bathing pools or beaches, and a study of the quality of water. A sufficient number of bacteriologic water samples should be taken of the waters at the proposed beaches to ensure that the pollution, if any, will not adversely affect those bathing. In tidal waters, samples should be taken at ebb and flood tides as a study of the pollution which may be carried into the beaches by tidal action.

Recommendation should be submitted to the commanding officer, through the surgeon, of the findings by the sanitary engineer. Recommendations should include the starting and stopping dates for swimming, the areas to be used, bathhouses, water supply, and sewerage. In the case of outdoor pools, the source of potable water, chlorination and recirculation, details of pool construction, and swimming load should be included in such recommendations.

Garbage and Refuse

The sanitary engineer shall make necessary recommendations for the adequacy of garbage and refuse disposal, accomplished by an ordinary dump, sanitary fill, or incineration. Frequent inspections should be made by him to determine adequacy of disposal. Recommendations for any proposed changes shall be made to the post engineer through the surgeon.

Conclusion

Most sanitary engineers have additional duties as assistant medical inspectors where the general sanitation of mess halls, barracks, post exchanges, cafeterias, barber shops, bakeries, laundries, and other buildings is constantly inspected for cleanliness in line with Army requirements.

It is highly important for the sanitary engineer of a post to know his duties specifically and not in any way encroach on the duties of the post or area engineers or of the unit commanders. He must not give orders to subordinate workers of such departments, but convey his recommendations through channels to the officer responsible. He must be tactful, reliable, conscientious, and, above all, honest and forceful, as his is an important job since others rely on him for advice to ensure the protection of the health of military personnel.

Summarizing, the sanitary engineer advises the commanding officer through the staff surgeon concerning sanitation problems, conditions, and procedures within the command, and recommends the employment of specific sanitary measures to protect the health of unit personnel. He investigates available means for procuring and purifying water supply, disposal of sewage and refuse, insect and rodent control, sterilization of clothing, and sanitation of sleeping quarters and mess facilities; determines, by observation and laboratory tests, equipment needed and projects to be instituted to maintain or improve sanitary conditions within the command; renders technical advice on the installation and maintenance of sanitary equipment, water and sewage disposal plants, drainage, spraying, and other sanitary facilities and control measures. He may command a sanitary unit and be responsible for its administration, supply, transportation, and training.

He should be able to conduct field and laboratory investigations to determine fitness of water for consumption and to determine extent and nature of entomologic and bacteriologic hazards.

Index

(*Over*)

Carlisle Barracks, Pa., 6-4-45—78,500